7.0 BIOLOGICAL RESOURCES

The project area supports diverse biological resources. This section is organized into three subsections: (7.1) Aquatic Resources, which includes fish and aquatic invertebrates; (7.2) Wildlife Resources, which includes amphibians, reptiles, birds and mammals; and (7.3) Botanical Resources. The required Biological Evaluations (BE), Management Indicator Species (MIS) Report, and Biological Assessments (BA) have been completed f or this project. The following section includes summaries of the analysis and effects determinations contained within those three documents.

7.1 Aquatic Resources

7.1.1 Environmental Setting/Affected Environment

This section discusses the existing aquatic resources, fishes and aquatic macroinvertebrates that are associated with the project area. Amphibians are covered in Section 7.2, Wildlife Resources, even though they have an aquatic larval life history stage and may have aquatic-associated sub-adult and adult life history stages. This section provides an overview of the typical aquatic species and their habitats found in project area waters. In the California Fish and Game Code the term “fish” means fin fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn, or ova thereof. Within this report, “fish” refers only to fin fish. Other aquatic organisms are referred to by more specific names such as mollusks, macroinvertebrates, amphibians, etc.

7.1.1.1 Physical Setting

Lake Davis

Lake Davis’s shallow depths (average of 21 feet) and high nutrient content make it highly productive. It supports high densities of zooplankton (DFG 2003b) and most of the bottom of the reservoir supports aquatic vegetation and algae. With the spring thaw of the reservoir, aquatic vegetation and filamentous algae begin to grow. In some years, thick mats of aquatic vegetation can cover almost the entire reservoir surface from mid-summer through fall (DFG 2005b). The DWR (1971) reported that rooted aquatic plants covered all areas of the reservoir less than 15 feet deep, or about 40 percent of the reservoir surface area during peak growth. In 2004, a California Department of Fish and Game (DFG) survey found thick aquatic vegetation covering about 20 percent of the reservoir surface during August and September (DFG 2004b)

Lake Davis is thermally stratified during the warm summer months. Stratification typically begins to develop in May, is well-developed from June through August, begins to break down in September, and has completely diminished by October (DWR 1971, De Lain 1983). This period will vary somewhat from year to year. During the summer months, June through September, surface water (epilimnion) temperatures can exceed 72°F (22°C). Cooler temperatures are available below the thermocline. During the period when the reservoir is stratified, dissolved oxygen concentrations in the epilimnion are at saturation levels, and bottom (hypolimnion) waters are nearly anoxic. A rapid drop in dissolved oxygen

concentrations often occurs within 3 to 6 feet (1 to 2 m) of the surface. Dissolved oxygen concentrations during the height of the summer are generally less than 5 mg/L at depths greater than 10 to 25 feet (3 to 10 m), depending on the year and the season. From January through May, and October through December, temperature and dissolved oxygen are similar throughout the water column.

Big Grizzly Creek upstream of Lake Davis

Big Grizzly Creek upstream of Lake Davis is a third order stream draining a watershed of about 13.4 square miles (3,480 hectares). It begins at the overflow of Summit Lake and runs through about 5.5 miles (6.5 km) of open meadow before emptying into Lake Davis. Big Grizzly Creek has 13 tributaries, four of which are second order streams and one is a third order stream. The total length of tributary streams, including the main-stem, is estimated to be about 32 miles (50.5 km). There are no long-term flow records for any of the tributary streams to Lake Davis, and only a few estimates of flow have been found. It is unknown how much of this channel length is perennial or how much of it may go dry or have residual pools of water during the summer. The mainstem of Big Grizzly Creek is reported to be perennial (USFS 2004a), as is Old House Creek, its largest tributary. However, Old House Creek also has been reported to go dry around mid July (Schatz n.d., Newman n.d.). Old House Creek joins Big Grizzly Creek about 1.5 miles (2.5 km) upstream of Lake Davis.

Freeman Creek

The mainstem of Freeman Creek is a third order stream about 4.5 miles long. The watershed area is about six square miles (1,540 hectares) drained by about 12 miles (19.6 km) of mainstem and tributary channel. Freeman Creek has seven tributaries, one of which is a second order stream; the remaining six are first order streams. Three springs have been identified within the Freeman Creek watershed from USGS topographic maps. The mainstem of Freeman Creek is reported to be perennial (USFS 2004a). It is unknown how many of the tributary streams and springs are perennial. Flows in Freeman Creek during the spring of 1983 and 1984 were reported as ranging from 5.5 to 7.1 cfs (Schatz n.d.) and a flow of 5 cfs was estimated in October 1973 (USFS 1973). Water temperatures ranged from 41 to 73.4°F (5 to 23°C) during August of 1983 and 1984 (Schatz n.d.). During this period, average difference between the high and the low daytime water temperature was 50 to 53.6°F (10 to 12°C). A water temperature of 52.7°F (11.5°C) was recorded during April 1992 (Lake Davis Fisheries 1992).

Cow Creek

Cow Creek is a second order tributary to Lake Davis and itself has only one tributary. No springs are noted on USGS topographic maps within the Cow Creek watershed. The stream is reported to be perennial (USFS 2004a). Cow Creek drains a watershed of about 4.7 square miles (1,215 hectares) with about 5.7 miles (9.1 km) of stream channel.

Summer flows averaged 0.05 to 0.75 cfs and high spring flows range from 2 to 5 cfs (Schatz n.d.). Water temperatures for Cow Creek were 42.8 to 71.6°F (6 to 22°C) in August of 1983

and 1984. Daily temperature fluctuation ranged from 46.4 to 50°F (8 to 10°C) (Schatz n.d.). Water temperature taken in April of 1992 was 58.1°F (14.5°C) (Lake Davis Fisheries 1992).

Other Tributaries

In addition to the three major tributaries described above, 19 other streams are tributary to Lake Davis. Jenkins Creek is a 0.5 mile long, spring fed tributary to Lake Davis. This first order stream drains into Jenkins Cove along the reservoir's western shore. Based on the Freeman Creek Rapid Assessment (USFS 2004a), this creek is believed to be annual.

Dan Blough Creek is a second order perennial stream which drains into Dan Blough Cove on the southwestern edge of Lake Davis. The total length of stream channel (mainstem and tributaries) is estimated to be about 4.6 miles (7.4 km) with about 1.5 miles of this length downstream of known springs. This stream is perennial (USFS 2004a).

The remaining 17 tributaries of Lake Davis are generally small, first order unnamed water courses. Four of these streams contain springs within their watersheds. Only one of these streams, located on the northeastern side of the reservoir, is large enough to be considered second order. These 17 tributaries collectively represent 17.6 channel miles (28 km), less than one-third the length of the five named tributaries above.

Big Grizzly Creek Downstream of Lake Davis

Below Big Grizzly Dam, Big Grizzly Creek runs for 6.7 miles (11.2 km) until it joins the Middle Fork Feather River. To help prevent Big Grizzly Dam from spilling, releases of up to 235 cfs have been made in the spring (DFG 1997). The minimum instream flow below the dam is 10 cfs year round. Summer flow below the dam was generally between 10.6 and 21.2 cfs from 1974 to 2004 (Brown 2005). Water temperature for the reach below dam was recorded at 68°F (20°C) on July 19, 1978, when the flow was 2 cfs (Bauman and Huhtala 1978). On October 14, 2004, the water temperature was recorded at 58.1°F (14.5°C) (Brown 2005).

Middle Fork Feather River

The Middle Fork Feather River is nearly 108 miles long and drains a 1,240 square-mile watershed composed of three geomorphically distinct areas; the eastern Sierra Valley, the central glacial valleys and the Middle Fork Canyon (DFG 1982). The headwaters of the river are located near the town of Vinton in Plumas County and it flows into Lake Oroville in Butte County. Notable tributaries along this river include; Little Last Chance Creek, Big Grizzly Creek, Sulphur Creek, Frazier Creek (drains from Gold Lake), Nelson Creek, Onion Valley Creek, Bear Creek, Willow Creek the Little North Fork of Middle Fork Feather River, South Branch of the Middle Fork Feather River, Fall River, and Frey Creek.

The Sierra Valley section of the Middle Fork Feather River extends from Vinton to Clio. Numerous creeks and an interconnected irrigation system join near Vinton to form the headwaters of the Middle Fork Feather River. The valley is a flat-bottomed lake bed at an elevation of 4,880 feet. (DFG 1982) In this reach, habitat is characterized by long shallow pools with few interspersed riffles. Summer flows drop to very low levels (<0.2 cfs) in many

of the upper tributaries. However, Little Last Chance and Big Grizzly Creeks, flowing from Frenchman Lake and Lake Davis, respectively, provide flow year round due to releases of stored water. The minimum required summertime releases to provide fish flow is 2 cfs (or reservoir inflow, whichever is less) from Frenchman Lake with Lake Davis providing an additional 10 cfs or more. The sum of minimum instream flow releases from the two reservoirs, during the winter, ranges from 14 to 18 cfs.

Summer water temperatures are generally warm, up to 82°F (28°C), and turbid. A few deep pools and spring-fed areas manage to stay cool, supporting pockets of isolated aggregations of trout. Low flows, high water temperatures and poor water quality are characteristic of summer and fall flows in the upper reaches of the Middle Fork Feather River.

The central valleys are a series of narrow, inter-connected glacial valleys, ranging from 0.5 to 2 miles across their floors (DFG 1982). This section has a low gradient. From Portola to Sloat, the river drops only 700 feet in 31 miles. The average low flow in this area is about 16 to 40 cfs, occurring in October. Temperatures may reach 75°F (24°C) and may fluctuate by 14°F (10°C) per day.

The Middle Fork Canyon extends from about 1 mile below Sloat to Lake Oroville. This 48-mile reach is steep and rugged, dropping at a rate of 67 feet per mile. The average low flow in this portion of the river is about 70 to 140 cfs. This reach is characterized as “rugged, remote and pristine” (DFG 1982).

7.1.1.2 Species/Communities Present

Twenty-two species of fish have been documented from the project area. Five of these species are native to the area (3 minnows, 1 sucker, 1 salmonid); two other species, while native to other parts of California, were introduced to the upper Middle Fork Feather River system (Lahontan redsides and Sacramento perch). Fourteen exotic species have been introduced from outside California (7 centrarchids, 3 minnows, 2 salmonids, 2 catfishes, and northern pike). Not all species may currently be present in the project area; for example, Sacramento perch and fathead minnows are known only from historical records (Table 7.1-1).

In Lake Davis and its tributaries, rainbow trout is the only native species (DFG 2003a). In Big Grizzly Creek, downstream of the reservoir, rainbow trout and Sacramento suckers are the only native species. In the Middle Fork Feather River, native species include rainbow trout, Sacramento sucker, Sacramento pikeminnow, California roach, and speckled dace.

There are no fish species that are USFS sensitive, California Species of Concern, or listed as threatened, endangered, or candidate for listing under the California Endangered Species Act (CESA) or the Federal Endangered Species Act (ESA) (collectively referred to as “special status” species) within the project area. No anadromous fish use the Middle Fork Feather River because access was blocked by Curtain Fall and Bald Rock Canyon on the Feather River.

The principal fish species that are actively managed within project waters are rainbow, brown, and brook trout, and northern pike. An additional sport fish present in the reservoir is

the largemouth bass. All trout species and largemouth bass are USFS management indicator species (MIS) (Table 7.1-2).

There are hundreds of species of aquatic invertebrates in the waters of the project area. Macroinvertebrates are animals that have no backbone and are visible without magnification. Stream-bottom macroinvertebrates include such animals as crayfish, mussels, aquatic snails, aquatic worms, and the larvae and some adult forms of aquatic insects. These species include members of over a hundred taxonomic families. Invertebrates are important members of the aquatic ecosystem. They are the primary consumers and feed on each other, algae, aquatic plants, phytoplankton, bacteria, and detritus. Many of the aquatic invertebrates are important food resources for fish and other macroinvertebrates.

Macroinvertebrates are described by the ecosystem in which they are found (spring, stream, or reservoir). Within the reservoir, the communities are described by the type of habitat they occupy: open water (limnetic), near shore bottom dwellers (littoral), or deep water bottom dwellers (benthic). These macroinvertebrate communities are composed of different species, which are adapted to the specific habitat features of each zone. Stream and spring macroinvertebrate communities are different than those in the reservoir, but there is some overlap. While there is considerable overlap in the communities that inhabit streams and springs, there are some species that are unique to each environment, being adapted to the specific conditions there. The macroinvertebrate community as it exists in the Lake Davis project area experienced a previous chemical treatment in 1997. A description of post-1997 communities is provided below.

No species known or suspected to be present are listed under either State or Federal ESA statutes (Table 7.1-2), nor are there any USFS management indicator species (MIS) known or suspected to be present. However, one macroinvertebrate species recently collected from Big Grizzly Creek upstream of Lake Davis, the amphibious caddisfly (*Desmona bethula*) (Sibbald, pers. com., 2006) is a California Species of Concern. Other macroinvertebrate specimens collected from the area have been identified to genera that contain other California Species of Concern; therefore, other special status macroinvertebrate species could be present. Additionally snails from the family Hydrobiidae (springsnails) have been collected within the project area. This family of snails contains a high number of endemic species distributed throughout the western United States. Endemic species are those who are native to a certain limited area, and nowhere else.

Table 7.1-1. Fish Species Present by Waterbody

Species	Species Origin[1]	Lake Davis[2,3]	Big Grizzly Creek (Upstream of L. Davis)[3]	Freeman Creek[3]	Cow Creek[3]	Big Grizzly Creek (Downstream of L. Davis)[4]	Middle Fork Feather River[2,5]
Principal Management Species							
Rainbow trout (*Oncorhynchus mykiss*)	N	X	X	X	X	X	X
Brown trout (*Salmo trutta)*	I	X	X	X	X	X	X
Brook trout *(Salvelinus fontinalis*)	I	X		X	X		
Northern pike (*Esox lucius*)	I	X	X	X			H
Other Species Present							
Lahontan redside (*Richardsonius egregius*)	N*	H					X
California roach (*Lavinia symmetricus*)	N						X
Sacramento pikeminnow,(*Ptychocheilus grandis*)	N						X
Speckled dace (*Rhinichthys osculus*)	N	H					X
Sacramento sucker (*Catostomus occidentalis*)	N	H				X	X
Golden shiner (*Notemigonus chrysoleucas*)	I	X	X	X	X		
Carp (*Cyprinus carpio)*	I						X
Black bullhead (*Ameiurus melas*)	I	H				X	
Pumpkinseed sunfish (*Lepomis gibbosus)*	I	X					
Green sunfish (*Lepomis cyanellus*)	I					X	
Bluegill (*Lepomis macrochirus*)	I	H					X
Largemouth bass (*Micropterus salmoides*)	I	X				X	
Smallmouth bass (*Micropterus dolomieu)*	I		X				X
Brown bullhead (*Ameiurus nebulosus)*	I	X					X
Spotted bass (*Micropterus punctulatus)*	I						X
Redeye bass (*Micropterus coosae)*	I						X
Sacramento perch *(Archoplites interruptus*)	N*	H					
Fathead minnow (*Pimephales promelas)*	I	H					

N = Native, N* = Native to California, but not to this area, I = Introduced, X = Existing occurrence, H = Historical record
[1] Moyle, P.B. 2002.
[2] DFG, 1997
[3] Save Lake Davis Task Force (SLDTF) and DFG. 2000
[4] Brown, C.J. 1998–2005
[5] California Department of Water Resources (CDWR). 2004

Table 7.1-2. Special Status Aquatic Species Potentially Occurring in the General Vicinity of Lake Davis

(Species identified by shading are not present in the project area and have been excluded from further analysis.)

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Fish						
Rainbow trout (*Oncorhynchus mykiss*)		MIS			Rears in stream or reservoir habitat. Spawns in clean gravel in stream riffles or pool tailouts.	Occurs in Lake Davis and all project area streams.
Brown trout (*Salmo trutta*)		MIS			Rears in stream or reservoir habitat. Spawns in clean gravel in stream riffles or pool tailouts.	Occurs in Lake Davis and all project area streams.
Brook trout (*Salvelinus fontinalis*)		MIS			Rears predominantly in stream, but may be seen in reservoir occasionally. Spawns in clean gravel in stream riffles or pool tailouts.	Occurs in tributary streams to Lake Davis and occasionally in the reservoir.
Largemouth Bass (*Micropterus salmoides*)		MIS			Rearing occurs primarily in reservoir, but may also occur in large, deep, slow pools in streams. Spawning occurs in shallow areas, usually associated with cover from woody debris or weed beds.	Occurs in Lake Davis and some project area streams.
Hardhead (*Mylopharodon conocephalus*)		FSS	CSC		Slow, deep, pools in low to mid-elevation large streams and in some reservoirs. Broadcast spawn over riffles.	Does not occur in any project area waters.
Macroinvertebrates						
Amphibious caddisfly (*Desmona bethula*)			CSC		Low order streams in open, wet-meadow areas. The species is unique, however, in that it emerges from the water to feed on streamside grasses and herbaceous plants on early summer nights during a portion of its larval development. *D. bethula* larvae build cases of sand and organic debris. Larvae pupate by the late summer or early fall and emerge as winged adults in early October.	Known to be present in streams and springs tributary to Lake Davis.

Table 7.1-2. Special Status Aquatic Species Potentially Occurring in the General Vicinity of Lake Davis

(Species identified by shading are not present in the project area and have been excluded from further analysis.)

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
King's Creek Parapsyche Caddisfly (*Parapsyche extensa*)			CSC		Small, cold, mountain streams. They build shelters of sand and detritus with a small silken web for catching food particles.	Known from Nevada County, CA. Members of this genus, that have not been identified to species level, have been observed in waters tributary to Lake Davis.
Spiny Rhyacophilan Caddisfly (*Rhyacophila spinata*)			CSC		Adults have been collected from vegetation along fast, second order streams at varied elevations but the larvae have not been found. The larvae of the *Rhyacophila* genus are free living and predacious. Before pupating, they build a crude shelter of rocks and sand.	Known from Placer, Plumas, and Sierra counties, CA. Members of this genus, that have not been identified to species level, have been observed in waters tributary to Lake Davis.
Cold Spring Caddisfly (*Lepidostoma ermanae*)			CSC		The larvae dwell in cold (37.4 to 39.2°F [3 to 4˚C]) springs, lack gills, and make cylindrical cases of tiny rocks. Adults emerge from mid-July to mid-August.	Known from Nevada County, CA. Members of this genus, that have not been identified to species level, have been observed in waters tributary to Lake Davis.
Golden-Horned Caddisfly (*Neothremma genella*)			CSC		This species lives in second or sometimes first order streams in the Sierra Nevada over a wide range of elevations. Larvae live on rocks in fast water and build horn shaped cases of sand and silk. Adults emerge from mid-August to early October.	Known from Madera, Plumas, and Sierra counties, CA. To the present, all members of this genus found in the Lake Davis watershed have been identified as belonging to another species.
Sagehen Creek Goeracean Caddisfly (*Goeracea oregona*)			CSC		Larvae live on rocks in relatively warm (48.2 to 51.8°F [9 to 11˚C]) springs where they feed on vegetation and may take two years to complete their life cycle. Adults have a long emergence period (June–October) when they exhibit almost flightless mating behavior.	This species is known form several locations in both California and Oregon. To the present, all members of this genus found in the Lake Davis watershed have been identified as belonging to another species.

Table 7.1-2. Special Status Aquatic Species Potentially Occurring in the General Vicinity of Lake Davis

(Species identified by shading are not present in the project area and have been excluded from further analysis.)

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Long-Tailed Caddisfly (*Farula praelonga*)			CSC		The larvae of this species live in first and second order springfed streams in the Sierra Nevada in shaded areas with constant (around 48.2°F [9˚C]) temperatures. The larvae of the *Farula* genus build slender cases of fine sand and silk and graze on diatoms on the surfaces of rocks. The larvae pupate in aggregations on the underside of rocks.	To the present, all members of this genus found in the Lake Davis watershed have been identified as belonging to another species.
King's Creek Ecclisomyian Caddisfly (*Ecclisomyia bilera*)			CSC		The larvae live in small, cold springs among rocks and gravel where they construct straight slender cases and probably feed on algae and plant material. Adults emerge from May through August and exhibit near flightless mating behavior.	This species has been identified in Lassen and Sierra counties, and other sites in the northern Sierra Nevada. To the present, all members of this genus found in the Lake Davis watershed have been identified as belonging to another species.
Springsnails (Family Hydrobiidae)	To be Determined based on additional studies in 2006				Gilled springsnails spend their entire life cycle in spring waters feeding on algal and plant material. They spawn only once in their life. They are poor dispersers, and because they never emerge from their small and fragmented habitats, springsnail populations will often have great genetic distinctiveness even between springs in close proximity.	Specimens collected from springs and streams within the project area have been identified only to Family at this time. This family of snails contains a high number of endemic species. the DFG is working to obtain better identification.

ESA Listings
FC = Federal Candidate
FD = Federally Delisted
FE = Federally Endangered
FT = Federally Threatened

USFS Listings
FSS = Forest Service Sensitive
MIS = Management Indicator Species

State Listings
CE = California Endangered
CSC = California Species of Concern
CT = California Threatened
FP = Fully Protected Species

Calfed Listings
MSCS = Multi-Species Conservation Strategy

7.1.1.3 Life History Descriptions of Fish Species

Information presented on life histories for fish was summarized from Moyle (2002) or Maniscalco and Morrison (2006, Appendix A). The 11 species discussed include species that presently occur in Lake Davis, its tributaries, or in Big Grizzly Creek downstream of Lake Davis. Species that are known from only historical collections are not included.

Northern pike (*Esox lucius*)

Northern pike are native to lakes and rivers at latitudes between 41 and 54 degrees North in Europe, Asia, and North America. They have been introduced widely throughout the United States, both legally, to increase recreational fishing opportunities or to reduce populations of non-desirable species; and illegally, to establish recreational fisheries (Maniscalco and Morrison 2006, Appendix A). Populations of pike have been widely established outside of their native range, and self-sustaining populations exist in Arizona, within a few miles of the Mexican border. Pike were first reported in Plumas County in 1988, and were confirmed to be present in Lake Davis in 1994 (Dill and Cordone 1997).

Pike are top predators and have large mouths and torpedo-shaped bodies that make them ideally suited as lie-in-wait predators. They feed primarily on fish once they attain a length of about eight inches, which they reach at the end of their first year in Lake Davis. However, pike are opportunistic and will prey on anything that is available, such as fish, macroinvertebrates, crayfish, frogs, birds, and small mammals. They can take prey half the size of their own body length. Pike as small as 1 inch (25 mm) will eat other fish.

Pike can tolerate a wide range of water quality conditions, including dissolved oxygen of concentrations as low as 0.5 mg/L, a wide range of water temperatures (spawning 39.2 to 66.2°F [4 to 19°C], rearing 32 to 86°F [0 to 30°C]), pH of 5 to 9.5, and salinity up to 18 parts per thousand (ppt). They are visual predators and prefer clear water; they are generally not found in waters where visibility is less than 6.5 to 13 feet. High turbidity can reduce growth rates. The success of pike is highly dependent upon aquatic vegetation, which they use throughout their lives. Pike prefer still water that is sheltered from wind and currents. The following paragraphs summarize their habitat requirements by life stage.

Spawning

Pike are highly fecund, with the number of eggs produced being related to the size of the fish. A five-pound female (2.5 kg) can produce 30,000 to 80,000 eggs. Spawning takes place from February to March at the southern limit of their geographic distribution and May through June in their northern distribution. At Lake Davis, pike spawn immediately at ice-out which is usually in early April. Spawning is stimulated by increases in water temperature, light intensity, and the presence of aquatic vegetation. Spawning occurs when temperatures range from 38 to 69°F (3.5 to 19°C). Adults migrate to suitable spawning areas, which include littoral zones in lakes and reservoirs, marsh areas, streams and rivers, and ditches adjacent to the shoreline. Fish have been observed to migrate up to 47 miles (75 km), to spawning locations. Spawning typically occurs in water less than 3 feet (1 meter) deep, but can occur at depths up to 23 feet (7 meters).

Submerged aquatic or flooded marsh vegetation is critical for spawning, and without it, reproductive success is low. Pike scatter their eggs over large areas of dense vegetation. The eggs settle onto the vegetation and adhere. Optimal spawning habitat occurs in areas where vegetation obscures more than 80 percent of the bottom. Suitability of an area for spawning decreases as the density of vegetation decreases. Eggs hatch in 12 to 14 days. Optimal temperatures for development and hatching range between 44 to 64°F (6.4 to 17.7°C).

Embryos and Larvae

After eggs hatch, the yolk sac embryos are attached to plants by adhesive glands on the top of their heads. The yolk sacs are absorbed after 5 to 16 days, depending on the water temperature, ideally between 50 to 66°F (10 to 19°C), after which the larva release from the plant and become free-swimming. At the end of the embryonic period, fry are 0.45 to 0.51 inches (11.5 to 13 mm) long. Young pike begin feeding at this stage, with their diet composed mainly of zooplankton and other macroinvertebrates associated with vegetation. The size of their prey items increases with the size of the fish. At 0.80 inches (20 mm), the young pike are considered to be in the larval stage. Growth in the larval stage has been estimated to be about 0.40 inches (10 mm) per week in the Great Lakes region.

Stimulated by decreases in water levels, elevated water temperatures, increased light intensity and increased feeding competition, larval pike will migrate from spawning areas to sparser vegetated areas once they grown beyond about 0.8 inches (20 mm). Small fish may become part of their diet at this about size.

YOY and Juveniles

At 2.5 inches in size (64 mm) pike are considered to be young-of-the-year and need a combination of submerged and emergent vegetation with an optimum density of 20 to 50 percent. They prefer shallow water. Their preferred depth is 4 inches (100 mm) for every 0.5 inch (12 mm) in body length. Their diet includes zooplankton and macroinvertebrates, but fish become increasingly important as the pike grow. Optimal temperatures for growth at this life stage are 72 to 73°F (22 to 23°C).

Adults

Adults occupy habitat with submergent vegetation. They require a minimum of 30 percent cover by aquatic vegetation. Adults were found in water from approximately 13 feet (4 m) in depth to about 39 feet (12 m). When pike become larger than eight inches (20 cm), fish become the dominant component of their diet. Soft-rayed fish, such as minnows and salmonids, are the preferred prey item. However, adults switch prey readily depending on prey availability, and as previously discussed, will take frogs, ducks, or even small mammals.

Growth varies depending on habitat conditions and food availability. Optimal temperature for growth is about 69°F (19°C) for juveniles and adults. Growth occurs at higher and lower temperatures, as well, but at slower rates. Growth is highest when dissolved oxygen concentrations are near saturation and decreases rapidly as dissolved oxygen decreases.

Growth stops when dissolved oxygen levels are less than 2 mg/L, although the fish may survive dissolved oxygen concentrations as low as 0.5 mg/L.

Pike reach sexual maturity at 1 to 3 years of age. Reproductive pike have a minimum length of 7 inches (18 cm) for males and 10 inches (26 cm) for females. In Lake Davis, fish attain these sizes in their first or second year. Males are presumably able to spawn by their second year, and females by their third year.

Rainbow trout (*Oncorhynchus mykiss*)

Rainbow trout are native to drainages to the Pacific Ocean in North America and Asia. They are the only species native to the Lake Davis watershed, but since the creation of the reservoir, their populations have been supported by planting hatchery trout of various origins. Rainbow trout have a flexible biology and life history behavior. In small streams and high mountain lakes, rainbow trout seldom live longer than six years of age or grow to be larger than 16 inches (40 cm) total length. Most wild rainbow trout reach sexual maturity in their second or third year and usually spawn between February and June, depending on water temperature and strain.

Rainbow trout spawn in streams. Spawning occurs in nests (redds) dug in gravel, usually in riffles or pool tailouts. The embryos hatch in 11 weeks at 41°F (5°C) and 15 weeks at 38°F (3.5°C). Fry emerge from the gravel two to three weeks after hatching, depending upon temperature. Juvenile and adult rainbow trout may migrate into a lake or other downstream areas or remain in the stream defending a small home range.

In streams, rainbow trout inhabit clear, cool, fast flowing water. Rainbow trout prefer streams with ample aquatic cover such as riparian vegetation or undercut banks. As fish grow in size, habitat use generally shifts from riffles for the smallest fish to runs for intermediate sized fish and pools for the largest fish. Stream dwelling fish feed mostly on drifting invertebrates, but will also eat benthic invertebrates. In lakes, feeding habits depend on the availability of prey. Rainbow trout in lakes may feed on zooplankton, benthic invertebrates, or small fish.

There is substantial regional variability in rainbow trout temperature tolerances reported in the published literature, It is generally accepted that temperatures less than 68°F (20°C) are suitable for growth. Mortality can occur at temperatures exceeding 81°F (27°C), although some fish may tolerate higher temperatures for brief periods.

Brown trout (*Salmo trutta*)

Brown trout are native to Europe and western Asia. This species was introduced in the Lake Davis watershed as a sport fish and their population is currently self- sustaining. Brown trout mature in their second or third year and spawn in the fall or winter. Spawning sites are not chosen until stream temperatures begin to cool significantly. Peak spawning activity generally occurs in October and November and tapers off in December. Spawning occurs in nests (redds) dug in gravel, usually in riffles or pool tailouts. Eggs hatch between 11 to 16 weeks. Habitat preference for brown trout has a high degree of overlap with rainbow trout.

In streams, fry and juvenile brown trout tend to prey on drift organisms, specifically terrestrial insects. Their diet shifts to aquatic invertebrates as they grow larger. In lakes they feed on zooplankton or macroinvertebrates. Brown trout greater than 10 in (25 cm) pursue large prey such as other fish, crayfish, and dragonfly or damsel fly larvae. Large fish, longer than 16 inches (41 cm), prey almost exclusively on other fish.

Brown trout growth is variable and depends on habitat conditions. Usually brown trout grow faster in large lakes and reservoirs than in streams, but in high alpine habitats growth may be low in both. Surface water temperatures in large lakes or reservoirs may be warmer than smaller high altitude mountain lakes, and, therefore, contribute to a better and longer growing season.

Preferred water temperatures for brown trout are 54 to 68°F (12 to 20°C) and optimal water temperatures are 62 to 64°F (17 to 18°C), although high growth rates have been found in temperatures of 54 to 68°F (12 to 18°C). Brown trout can survive water temperatures up to 82 to 84°F (28 to 29°C) for short periods of time.

Brook trout (*Salvelinus fontinalis*)

Brook trout are native to the northeastern United States and eastern Canada. This species was introduced in the Lake Davis watershed as a sport fish, and their population is self-sustaining.

Brook trout rarely live longer than four to five years of age. Males can mature at the end of their first year of life, but more commonly in their second year. Females may mature between their second and fourth year of life. Brook trout may begin their spawning migration in mid-September, but specific timing depends on water temperatures. Brook trout also are capable of spawning in lakes and reservoirs if suitable habitat exists. The peak spawning period lasts from October to December.

Embryos hatch after 12 to 16 weeks at water temperatures of 36 to 41°F (2 to 5°C). After hatching, fry emerge from the gravel three to four days after the yolk sac is absorbed. In streams and lakes, the fry move to the shallow edges among vegetation or backwater areas for cover. Fry remain in the shallows from June to October.

In streams, juvenile and adult fish will defend territories (often associated with areas of cover) against other trout. In lakes and reservoirs, juvenile and adult fish may move about individually in open water, schooling only when alarmed. Growth in brook trout depends on a number of factors, including length of growing season, water temperature, population density, and food availability and competition with other trout species. These factors frequently prevent brook trout from growing larger than 12 inches (30 cm) total length.

Brook trout are among the most cold tolerant of the trout species. They frequent clear, cold streams and are more common than rainbow or brown trout at higher elevations and in headwater areas where overall temperatures are cooler. They prefer temperatures of 57 to 66°F (14 to 19°C). They can survive temperatures up to 79°F (26°C), if acclimated, however growth is poor at temperatures above 66°F (19°C).

Golden shiner (*Notemigonus chrysoleucas*)

Golden shiners are native to the eastern United States including the Mississippi River system. They were introduced in San Diego County in 1891; however, they did not become prevalent throughout California until 1955, when it became legal to use them as live bait.

Golden shiners live primarily in warm, shallow ponds, lakes, and sloughs. They are commonly associated with beds of aquatic vegetation. They can tolerate water temperatures up to 99°F (37°C) and dissolved oxygen concentrations of <1 mg/liter. They often co-occur with other introduced species, such as largemouth bass, sunfish, and mosquitofish in low elevation reservoirs. While golden shiners occasionally establish in cold water bodies, they are likely to persist only if there are warm shallow areas to breed and rear young.

Golden shiners are most active during the day where they visually track prey. *Daphnia* is one the most abundant prey items for golden shiners in Lake Davis. They school together in littoral and pelagic zones in response to predators. Piscivorous predators may limit golden shiner population sizes in many lakes and reservoirs.

This species reaches only 1.5 to 2 inches in length (36 to 46 mm) by the end of their first year in cold water compared to 3 inches (76 mm) total length in warm lowland California ponds. Females generally grow faster and are larger than males reaching a maximum size of 10 inches (260 mm). Golden shiners are known to live up to 9 years of age.

Spawning season in California for this species begins in March and extends through September depending on water temperature. In cool lakes and reservoirs, shiners breed from early June to September. Spawning is induced once water temperatures reach 68°F (20°C) although spawning has been observed between 57 and 81°F (14 to 27°C). Females deposit between 2,700 to 4,700 or more eggs among submerged vegetation and debris to which they adhere, with embryos hatching in 4 to 5 days in 75 and 81°F (24 to 27°C) water. Young fry tend to gather in schools near shore among aquatic plants where they feed on small rotifers and epiphytic algae and then gradually switch to small crustaceans.

Sacramento sucker (*Catostomus occidentalis*)

The Sacramento sucker is a common, widely-distributed native species in central and northern California. This species is found in waters ranging from warm sloughs in low-salinity sections of the Delta to clear, cool streams, lakes, and reservoirs at moderate elevations. They are most abundant in larger streams and rivers at moderate elevations (650 to 2,000 feet or 200 to 600 m) in the transitional areas between the cold and warm water reaches.

Sacramento suckers first spawn at an age of about four to six. Spawning generally takes place in February through June, depending on water temperatures, and may continue into July or August in some systems. Water temperatures rising to 42 to 51°F (5.6 to 10.6°C) triggers spawning. In streams, suckers spawn over gravel riffles, whereas in lakes they spawn along shorelines. Spawning occurs in a group with an individual female being accompanied by several males. Females have been known to carry up to 11,000 eggs, which are broadcast over gravel. Eggs are slightly adhesive and about 1 to 2 mm in diameter.

Embryos hatch in two to four weeks and larvae initially remain in or among the gravel. Larval suckers swim up in the water column, but become more benthic as they grow larger. Larval suckers are found concentrated over detritus bottoms or in emergent vegetation in warm, protected stream margins. Young-of-the-year exercise schooling behavior in tributary streams. Juveniles that were spawned in tributary streams may spend two to three years in the streams before moving to a large river, lake, or reservoir during high flows. Juvenile suckers are found close to the bottom in shallow, low-velocity water along stream margins.

Small fish are found in the shallowest water, but in the absence of predatory fish species, use deeper water. Adults are most numerous in larger streams, and are found in deep pools and runs or beneath undercut banks near riffles. They generally are found in areas with cover from avian predators.

Suckers forage most actively at night, when they move up into riffles to feed. Their primary food is algae, diatoms, and invertebrates. Invertebrates become increasingly important as the fish grow larger, although algae remain an important component of the diet throughout life.

Sacramento suckers are found in a wide range of water temperature regimes, including streams with temperatures that rarely exceed 59°F (15 °C) and streams where temperatures are as high as 86°F (30°C). Preferred temperatures appear to be about 68 to 77°F (20 to 25°C). The upper lethal temperature for suckers acclimated to warm water in the laboratory was 97°F (36°C).

Black bullhead (*Ameiurus melas*)

Black bullhead are native to the United States east of the Rocky Mountains and were introduced into California at an unknown date. While “bullheads” were recorded in California as early as 1874, the first confirmed account of a black bullhead is from the Colorado River in 1942. Their somewhat unclear history in California is probably related to their similarity of appearance to other bullhead species.

Black bullheads prefer ponds, small lakes, river backwaters, sloughs and pools in low gradient streams with muddy bottoms, slow currents, and warm turbid water. They are capable of living in water temperatures up to 95°F (35°C) under natural conditions and 100°F (38°C) in aquaria. This species is tolerant of highly disturbed waters where dissolved oxygen concentrations can drop to 1 to 2 mg/liter and are quick to invade new and unoccupied areas. Black bullheads can tolerate saline conditions of up to 13 ppt. Black bullheads are usually associated with other exotic species typical of disturbed waters.

This is a highly social species that usually congregates in loose schools. They tend to seek cover during the day in aquatic vegetation and actively forage at night. Young-of-year bullheads are active in schools during the day, however and tend to feed only at dawn and dusk. Adults tend to be omnivorous bottom feeders on aquatic invertebrates, crustaceans, and mollusks and will occasionally take live or scavenge dead fish. In reservoirs, this species relies on the fluctuating water levels, eating earthworms and terrestrial insects inundated by rising water levels. They also will move out into open water to feed on fly larvae and pupae when these are abundant.

Black bullhead growth seems highly variable and dependent on temperature, food availability, and overcrowding. Female bullheads may lay between 1,000 to 7,000 eggs, however 2,500 to 3,000 seems more typical. Spawning occurs in June and July and is usually triggered by water temperatures in excess of 68°F (20°C), or a sudden rise in temperature. Females construct a nest, a depression scoured out of a mud bed or bank. This is followed by a courtship ritual. Eggs adhere to each other and form a yellow mass in the nest. Parents manually circulate water around the eggs for 5 to 10 days until they hatch. Fry remain in the nest for an additional 4 to 5 days until they become free-swimming. They remain together in a tight ball for 2 to 3 weeks or until they reach about an inch in length (25 mm), at which point they disperse.

Brown bullhead (*Ameiurus nebulosus*)

Brown bullheads arrived in California in 1874 when they were introduced into Sacramento County and are the most widely distributed bullhead in California. By 1890, this species was abundant and present in every county within California.

Brown bullheads are highly adaptable, ranging from warm turbid sloughs to clear mountain lakes. They are most abundant in larger bodies of water such as large rivers and foothill reservoirs where they are generally associated with the deep end of the littoral zone (5 to 16 feet [2 to 5 m]), with mats of aquatic vegetation, and muddy bottoms.

While brown bullhead may survive in temperature extremes ranging from nearly 32 to 99°F (0 to 37°C), optimal temperatures for growth seem to occur between 66 and 91°F (20 to 33°C). At low temperatures they become torpid and burrow into loose substrates, although feeding behavior has been observed in water temperatures as low as 39°F (4°C).

Brown bullheads are tolerant of a wide range of salinity and alkalinity. Moyle (2002) has recorded this species in waters with salinity in excess of 13 ppt. Additionally, a population that established in an alkaline lake with a pH of 8 in the early 1900s persisted until the pH climbed beyond 9. This species is able to survive in low dissolved oxygen environments by entering torpor at lower temperatures or by gulping air at higher temperatures.

Brown bullheads are most active at night where they form feeding aggregations. They feed along the bottom, swimming with their body angled down to allow only their barbels to touch the substrate. Small brown bullheads (longer than 2.4 inches [60 mm]) feed on small aquatic fly larvae and small crustaceans. As they increase in size, they will take larger insect larvae and fish.

Spawning occurs from May through July and usually begins when water temperature exceeds 70°F (21°C). Adults generally begin to spawn by their third year. Females construct nests which are comprised of a depression in mud or sand, near aquatic vegetation or large woody debris for cover. Courtship behavior occurs and the female will lay her eggs in multiple batches totaling 2,000 to 14,000 eggs. Parents guard the embryos until they hatch 6 to 9 days later and will continue to protect fry until they disperse at 2 inches total length (50 mm).

Pumpkinseed sunfish (*Lepomis gibbosus*)

Pumpkinseed sunfish are native to eastern North America including the Great Lakes and range from Canada south to northern Georgia. While the date of their introduction into California is not known, it is suspected that it occurred in 1908 when a mixed shipment of sunfish was released into Lassen County.

Pumpkinseed sunfish prefer clear to slightly turbid lakes, sloughs, or sluggish streams with beds of aquatic vegetation that support large populations of snails. This species appears adapted to life in cool waters, especially lakes or reservoirs with large seasonal fluctuations in water temperature. However, in aquaria, pumpkinseeds prefer warm water and can tolerate water temperatures up to 100°F (38°C). At these higher temperatures they can survive in waters with dissolved oxygen concentrations as low as 4 mg/liter. At low temperatures they can withstand dissolved oxygen concentrations less than 1 mg/liter. This species also shows a high tolerance of saline waters, persisting in habitats with salinity concentrations up to 17 ppt.

Pumpkinseeds feed by picking hard-shelled invertebrates from the bottom or from plants. Snails appear to be the most important component of their diet; however, aquatic insects are generally preferred. During summer, they will take aquatic insects despite large populations of available snail prey. The diets of all size classes of pumpkinseeds appear to overlap; with the exception of larvae, which tend to feed on zooplankton. Peak feeding activity occurs during dawn and dusk, but will cease altogether if water temperatures drop below 44°F (6.5°C).

Pumpkinseeds seem to grow more slowly than other sunfish, although cool water temperatures may be the cause. Although this species may live to 12 or more years of age, they seldom ever grow beyond 12 inches (30 cm) fork length. Sexual maturity occurs during the second or third year but does not seem greatly related to size, as stunted populations (fork length less than 4 inches [100 mm]) are not uncommon. Spawning occurs between April and June in California and is induced when water temperature approaches 55 to 62°F (13 to 17°C). Optimal sites are dominated by the oldest males and occur in shallow water (less than 3 feet [1 m]) on bottoms of sand, gravel, or woody debris. Nests are generally built in loose colonies but defended individually. A parental male may breed with several females and will guard the embryos for 3 to 5 days until they hatch. Each female may lay between 600 and 7,000 eggs with fecundity increasing with age and size. Hatched young disperse as soon as they are able to swim; they drift in the water column and feed on zooplankton for several weeks.

Green sunfish (*Lepomis cyanellus*)

Green sunfish are native to the Mississippi River system including the Great Lakes but have become widespread as a result of introductions. They were first introduced into California in 1891 in San Diego County but have established themselves in aquatic systems throughout the state.

Green sunfish inhabit small, warm, streams, ponds, and lake edges. They are generally rare in habitats that contain more than three or four other species of fish. Thus in lakes and

reservoirs they are usually only locally abundant in shallow, weedy areas that exclude larger or less tolerant species.

Green sunfish are incredibly adaptable in extreme environments. They are able to survive water temperatures in excess of 100°F (38°C), dissolved oxygen concentrations of <1 mg/liter and alkalinity up to 2,000 mg/liter. However, they have a very low tolerance to saline conditions, avoiding waters with 1 to 2 ppt. They seem to prefer more moderate conditions, with temperatures of 79 to 86°F (26 to 30°C) being optimal.

This species is an opportunistic predator on invertebrates and small fish. Young-of-year fish feed on zooplankton, small benthic invertebrates, and larvae of other fish species.

Green sunfish grow slowly and rarely reach lengths greater than 6 inches (15 cm). Large populations of stunted sized fish are common. This species becomes reproductively active at 2 to 3 inches (5 to 7 cm) in length, usually by the beginning of their third year. Spawning may occur in disturbed waters that exclude other fish species. Spawning activity peaks in May and June but continues into July and August. Green sunfish have been observed spawning at water temperatures between 59 to 83°F (15 to 28°C), however breeding activity generally does not begin until water temperatures reach 67°F (19°C). Breeding behavior begins with the congregation of males in shallow water. Males will then excavate nests in water 2 to 18 inches (4 to 50 cm) deep in fine gravel substrate near cover. Each female may lay between 2,000 to 10,000 eggs depending on her size. Fertilized eggs attach to the nest substrate where the male guards them for 5 to 7 days until they hatch and become free-swimming.

Largemouth bass (*Micropterus salmoides*)

Largemouth bass were introduced into California in 1891 and have since spread to most of the suitable waters. They are abundant in farm ponds, lakes, reservoirs, and river backwater where other nonnative fish are abundant as well.

Sexual maturity is reached during their second or third year. When water temperatures reach 59°F (15°C) (usually in April), males begin to build nests in rocky bottoms in lakes and reservoirs (13 to 16 feet [4 to 5 m] deep) or quiet areas of streams (1.5 to 6.5 feet [0.5 to 2 m] deep). Embryos hatch in two to seven days. Sac fry then usually spend 5 to 8 days in the nest. The male herds and guards the fry for an additional two to three weeks; they then disperse into shallow water.

For the first month or two, fry feed mainly on rotifers and small crustaceans. By the time they reach two inches, they feed largely on aquatic insects and fish fry, including those of their own species. Once largemouth bass exceed four inches, they usually subsist primarily on fish. Occasionally, adults prefer crayfish or amphibians.

Growth in largemouth bass is highly variable, depending on genetic background, food availability, inter-and intra-specific competition, temperature regimes and other limnological factors. Optimal temperatures for growth are 77 to 86°F (25 to 30°C), although growth will occur within a much wider range (50 to 95°F or 10 to 35°C).

Largemouth bass are normally found in warm, shallow (less than 20 feet or 6 m) waters of moderate quality with beds of aquatic plants. They are known to survive in isolated pools

during droughts or in polluted waters. They can persist in waters that approach 99°F (37°C) during the day with dissolved oxygen levels as low as 1 mg/liter. During periods of high flow, bass may be flushed out of streams, although they do have an astonishing capacity to persist on their own, by finding shelter in flooded areas. They quickly recolonize such streams and build up populations during periods of low flow.

7.1.1.4 Aquatic Invertebrate Communities

Macroinvertebrate communities are discussed below based on the types of habitat they occupy. The assemblage of invertebrates making up each invertebrate community is largely determined by the range of habitat conditions, such as water quality, vegetation structure and bottom substrate. More complex habitats generally contain a more diverse assemblage of taxa than more uniform habitats.

Reservoir Communities

Lake Davis contains a diverse array of habitats and at least three distinct ecological communities: open water, shallow water, and deep water. Also, some stream-dwelling taxa may find certain areas of the reservoir to be very suitable. The invertebrate communities in the reservoir are essential to the productivity of the trout fishery.

Limnetic (open-water) Community

The open waters of the reservoir are dominated by planktonic crustaceans, often referred to as zooplankton, that drift passively in the reservoir waters feeding mostly on algae. These freshwater zooplankton consist of copepods and cladocerans and, although they are not as diverse as the insect fauna of the reservoir, can reach enormous abundances in times of sunny weather and high algal productivity. Because zooplankton supports the base of the food web, their abundance affects everything from the production of fish to the clarity of the water (Hanson and Butler 1994). Other inhabitants of limnetic areas include larval phantom midges (Family: Chaoboridae) which can be found in the deeper parts of the reservoir where few other insects live.

Littoral (shallow-water) Community

The littoral zone is the shallow water area of a reservoir that extends from the shoreline out to a depth where rooted aquatic plants cease to grow. The littoral zone is usually the most diverse and productive habitat in lakes and reservoirs. Because Lake Davis is quite shallow (average depth of 21 feet when full), the littoral zone covers a major portion of the reservoir. It is populated by taxa associated with limnetic or benthic habitats, as well as a myriad of taxa associated with shoreline sediments, aquatic plants, or emergent wetland plants. In a reservoir such as Lake Davis, the taxa inhabiting the littoral zone are subjected to fluctuating water levels, the growth and dieback of vegetation and wave action. Midges (Family: Chironomidae) are very common along shoreline areas where they encyst and survive in the soil when water levels drop and then reemerge when water levels rise again. Predatory dragonfly and damselfly larvae (Order: Odonata), predatory diving beetles (Order:

Coleoptera), and the larvae of some mayflies (Order: Ephemeroptera) occupy and use submerged aquatic vegetation.

Benthic (deep-water bottom) Community

Within Lake Davis, the benthic community occupies the part of the bottom that is too deep to support rooted aquatic vegetation (deeper than about 15 feet). The invertebrate community at the bottom of Lake Davis has received very little scientific attention. Benthic communities in lakes and reservoirs are usually dominated by a few hardy taxa with relatively low metabolic rates that can tolerate low light levels and the frequently anoxic conditions. The soft benthic sediments of Lake Davis are most likely populated by larval midges (Family: Chironomidae), small freshwater clams (*Corbicula fluminea*), and aquatic segmented worms (Class: Oligochaeta).

Stream Communities

The streams within the Lake Davis watershed contain a far greater diversity of microhabitats than the reservoir itself. The mosaic of aquatic habitats such as riffles, pools, runs and backwaters, combined with substrate elements of boulders, cobble, gravel, sand, logs, undercut banks, vegetation, and adjacent floodplain provide a high diversity of habitats to support aquatic invertebrates. Some of these stream habitats have perennial flowing water. Others are seasonal or intermittent, but nonetheless may harbor a unique and diverse assemblage of species (Erman 1996). Stream habitat, substrate, and hydrology all influence the invertebrate community composition in different areas.

The larvae of three orders of insects, the Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) are important taxa in the Sierra Nevada and other mountain ranges of North America. These three orders tend to be found in habitats with cold, clear, unpolluted, running water and are often associated with desirable trout species. The absolute and relative abundance of these three taxa is used to evaluate stream health conditions in the metric referred to as the EPT Index.

In the Sierra Nevada these three insect groups contain high numbers of endemic species (Erman 1996). Not surprisingly, EPT species generally exhibit a higher degree of sensitivity to rotenone than other aquatic insects (Mangum and Madrigal 1999, Engstrom-Heg et al. 1978). Other important insect groups in Lake Davis tributaries include blackfly larvae (Family: Simulidae), riffle beetles (Family: Elmidae), and water pennies (Family: Psephenidae).

Spring Communities

The Lake Davis area is dotted with springs of various sizes and seasonality. About 48 of these are mapped on USGS topographic maps of the area (G. Sibbald pers. comm. to L. Wise April 24, 2006). During macroinvertebrate sampling conducted by the DFG in summer 2005, many of these springs or spring clusters were visited, and only five of these springs were found to be flowing. Two of the creek sites sampled were noted as being more spring-like than stream-like, with very low velocity water flowing through and around abundant aquatic

vegetation in a meadow-like setting. Two additional flowing spring sites were located and sampled in the fall of 2005.

Springs in the Sierra Nevada harbor a large number of endemic (native to or confined to a certain limited region) invertebrate species. Invertebrates in Sierra Nevada springs can be unique because spring habitats are isolated from each other. Springs maintain consistent temperatures and may therefore harbor relict species that were more widespread in previous climate conditions (Erman 1996). Invertebrate groups that specialize in spring habitats and contain many endemic species in the Sierra Nevada include caddisflies of the families Rhyacophilidae, Limnephilidae, Uenoidae, and Hydropsychidae as well as springsnails of the family Hydrobiidae. Very little is known about the complete ranges and populations of these species. There is a potential that the springs in the project area could contain endemic species.

7.1.1.5 Special Status Aquatic Invertebrates: Life Histories

One special status aquatic macroinvertebrate has been conclusively identified in the project area: the amphibious caddisfly (*Desmona bethula*). This is a California Species of Concern. Several additional aquatic invertebrates listed as California Species of Concern have the potential to occur within the project area. This is based on observations of individuals belonging to the genera containing species of concern that have not been identified to species level, or based on the geographic range over which these species have been observed. The life history and habitat requirements of these special status species are poorly known. The DFG will continue studies to identify any additional special status aquatic invertebrates within the project area through fall 2006. Mitigation measures have been developed to minimize impacts to these species, should their presence in the project area be confirmed.

Special Status Species Found within the Project Area

Amphibious Caddisfly (Desmona bethula)

The amphibious caddisfly is endemic to the Sierra Nevada and has been identified at isolated sites from Sierra County to Sequoia National Park. The aquatic larvae dwell in low order streams in open, wet-meadow areas (Erman and Nagano 1992). The life history of this species was studied in depth by Erman (1981) at sites around Sagehen Creek in the northern Sierra Nevada. Like many other caddisflies (Order: Trichoptera), *D. bethula* larvae build cases of sand and organic debris. The species is unique, however, in that it emerges from the water to feed on streamside grasses and herbaceous plants on early summer nights during a portion of its larval development. This nocturnal migration away from and back to the water is heavily influenced by temperature, light, and other factors. Larvae pupate by the late summer or early fall and emerge as winged adults in early October.

Genera Found with Unidentified Individuals Found in Project Area

Four caddisflies (Order: Trichoptera) have been identified in the project area that belong to the same genera as the California Species of Concern described below. These caddisflies

have not been identified as belonging to the species described and some of these genera contain several species.

King's Creek Parapsyche Caddisfly (Parapsyche extensa)

The species has been identified only from King's Creek in Lassen National Park. The larvae of the *Parapsyche* genus live in small, cold, mountain streams and build shelters of sand and detritus with a small silken web for catching food particles California Natural Diversity Database (CNDDB 2006).

Kings Canyon Cryptochian Caddisfly (Cryptochia excella)

The species has been identified in the Sagehen Creek basin in Nevada County, California. The larvae of the *Cryptochia* genus construct cases of woody debris and live in small, cold, streams and springs where they feed on detritus. *C. excella* larvae emerge in June and July. (CNDDB 2006).

Spiny Rhyacophilan Caddisfly (Rhyacophila spinata)

The species is distributed in Placer, Plumas, and Sierra counties, California. Adults have been collected from vegetation along fast, second order streams at varied elevations but the larvae have not been found (Erman and Nagano 1992). The larvae of the *Rhyacophila* genus are free living and predacious. Before pupating, they build a crude shelter of rocks and sand (CNDDB 2006).

Cold Spring Caddisfly (Lepidostoma ermanae)

The species has been identified in the Sagehen Creek basin in Nevada County, California. The larvae dwell in cold (37.4 to 39.2°F [3 to 4°C]) springs, lack gills, and make cylindrical cases of tiny rocks. Adults emerge from mid-July to mid-August (CNDDB 2006).

Special Status Species whose Geographic Range Includes the Project Area

Four caddisflies listed as California Species of Concern could potentially occur within the project area, based on their described geographic distribution. Sampling to date has not found any individuals belonging to this genera that have not been identified to the species level. Therefore, these species are currently not believed to be present in the project area.

Golden-Horned Caddisfly (Neothremma genella)

This species lives in second or sometimes first order streams in the Sierra Nevada over a wide range of elevations (Erman and Nagano 1992). It has been identified in Madera, Plumas, and Sierra counties. Larvae live on rocks in fast water and build horn shaped cases of sand and silk. Adults emerge from mid-August to early October. *N. genella* is easily confused with *Farula praelonga* (CNDDB 2006).

Sagehen Creek Goeracean Caddisfly (Goeracea oregona)

This species is known from several locations in both California and Oregon. Larvae live on rocks in relatively warm (48.2 to 51.8°F [9 to 11°C]) springs where they feed on vegetation and may take two years to complete their life cycle. Adults have a long emergence period (June to October) when they exhibit almost flightless mating behavior (Erman 1998).

Long-Tailed Caddisfly (Farula praelonga)

The larvae of this species live in first and second order spring streams in the Sierra Nevada, in shaded areas with constant (around 48.2°F [9°C]) temperatures. The larvae of the *Farula* genus build slender cases of fine sand and silk and graze on diatoms on the surfaces of rocks. The larvae pupate in aggregations on the underside of rocks. *F. praelonga* is easily mistaken for *N. genella* (CNDDB 2006).

King's Creek Ecclisomyian Caddisfly (Ecclisomyia bilera)

This species has been identified in Lassen County, Sierra County, and other sites in the northern Sierra Nevada. The larvae live in small, cold springs among rocks and gravel where they construct straight slender cases and probably feed on algal and plant material (CNDDB 2006). Adults emerge from May through August and exhibit near flightless mating behavior (Erman 1998).

Springsnails

Specimens of snail from the Family Hydrobiidae have been collected from springs and streams within the project area. Specifically, these include two unnamed springs, and Jenkins and Oldhouse creeks. These species have not been identified beyond the family level at this time. This family of snails contains a high number of endemic species distributed throughout the western United States. Gilled springsnails spend their entire life cycle in spring waters feeding on algal and plant material. They spawn only once in their life. They are poor dispersers, and because they never emerge from their small and fragmented habitats, springsnail populations will often have great genetic distinctiveness even between springs in close proximity. In some cases, a species may only exist in a single spring system. This makes them highly vulnerable to extirpation.

7.1.1.6 Aquatic Communities by Waterbody

Lake Davis

Since pike were rediscovered in 1999, the DFG has conducted yearly fish surveys. Lake Davis currently supports populations of rainbow trout, brown trout, brook trout, brown bullhead, largemouth bass, golden shiner, pumpkinseed, and, of course, pike (Table 7.1-3). The reservoir also supports open-water, littoral, and benthic macroinvertebrate communities, as described above. No special status fish or macroinvertebrates have been observed within the reservoir.

The rainbow trout fishery is supported by planting catchable-size, hatchery fish. All other species are self-sustaining. By September 2005, over 55,000 pike had been removed from the reservoir, but their overall number continues to increase (DFG 2006d).

Table 7.1-3. Lake Davis Fish Survey Abundance by Species and Year (DFG 2002, 2003, 2004)*

Species\Year	2002	2003	2004	Total
Northern Pike (*Esox lucius*)	17,635	13,632	12,930	44,197
Brown Bullhead (*Ameiurus nebulosus*)	1,133	1,341	2,651	5,125
Brook Trout (*Salvelinus fontinalis*)	72	0	0	72
Brown Trout (*Salmo Trutta)*	156	5	0	161
Golden Shiner (*Notemigonus chrysoleucas*)	7,713	2,800	1,009	11,522
Largemouth Bass (*Micropterus salmoides*)	42	50	43	135
Pumpkinseed Sunfish (*Lepomis gibbosus*)	5,799	3,208	4,692	13,699
Rainbow Trout (*Oncorhynchus mykiss*)	2,498	1,041	193	3,732

*Information from 2000 and 2001 was presented in graphical format only.

Figure 7-1 shows the increased catch per unit of effort (CPUE) of pike during monitoring conducted using boat electrofishing from 2000 to 2004. CPUE provides a standardized method of assessing fish populations. It is based on comparing the number of fish caught using a defined level of effort. When CPUE increases, it indicates proportional population increases. When it decreases, as it did for rainbow trout during this same timeframe (Figure 7-1, dashed line), it indicates decreasing populations. While Table 7.1-3 indicates a decreased catch of pike over the years, these catches are not standardized and do not provide a true representation of population trends.

Prior to the 1997 treatment, the reservoir also supported black bullhead, Sacramento sucker, Lahontan redside, speckled dace, and bluegill. These species were presumably eradicated from Lake Davis by the 1997 treatment. Prior to the construction of the dam the streams supported only rainbow trout (DFG 2006d). Only trout were restocked by the DFG after the 1997 treatment; it was believed that additional trout and minnow species would repopulate via upstream tributary streams (DFG 1997). The current species composition indicates that several other species either survived the treatment in the lake, repopulated from upstream tributaries, or were reintroduced to the lake through mechanisms other than a DFG replanting effort.

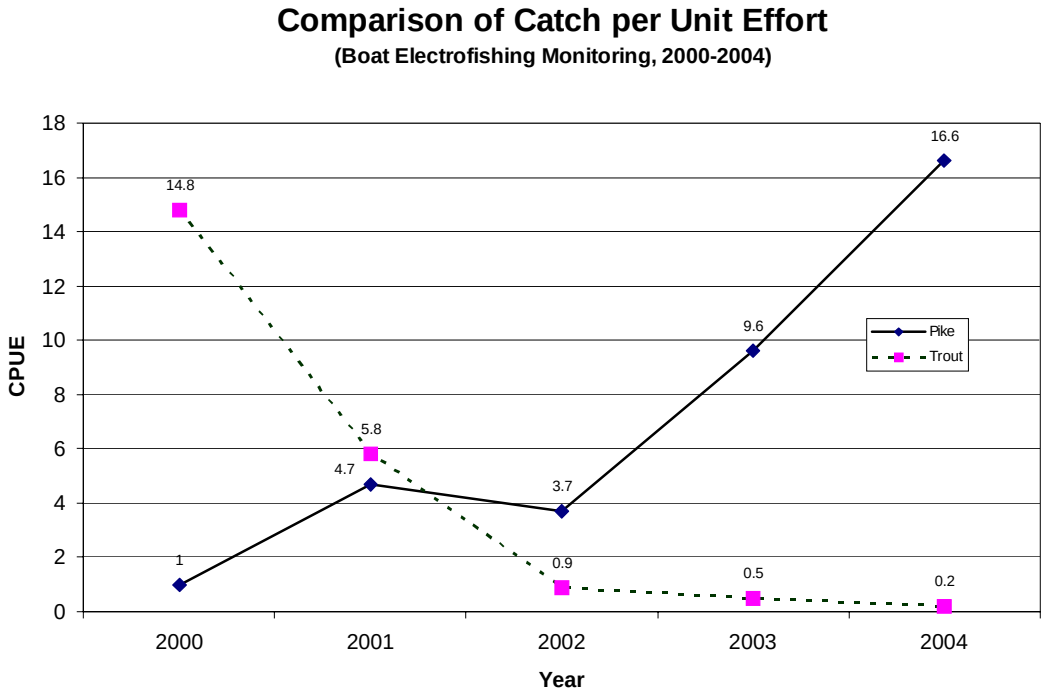

Figure 7-1 Catch per Unit Effort of Pike and Rainbow Trout in Lake Davis, 2000–2004

Summer conditions in Lake Davis are not ideal for trout. Temperatures in the epiliminion are higher than are suitable for trout. In the mesolimnion (the mixing layer between the epilimnion and the hypolimnion) and hypolimnion, where temperatures are more suitable for trout, dissolved oxygen concentrations are less than 5 mg/L, which approaches lethal limits for trout. There may be only a narrow range of depths that provide conditions suitable for trout during the summer months. Pike can tolerate higher temperatures and lower dissolved oxygen concentrations than trout. The range of temperatures and dissolved oxygen are acceptable to pike.

Big Grizzly Creek

Big Grizzly Creek is the largest of the tributaries to Lake Davis. Eight springs that contribute to Big Grizzly Creek have been identified from USGS topographic maps. During macroinvertebrate sampling in 2005, many of these springs were visited and found to be dry.

The stream flows through meadows and has little canopy (Schatz n.d.). Flows in Big Grizzly Creek upstream of Lake Davis have been estimated to be 8 to 12 cfs in spring (at this level the stream overflowed its banks) and 1 to 2 cfs during the summer (Schatz n.d.). Daytime water temperatures varied from 44.6 to 78.8°F (7 to 26°C) during August in 1983 and 1984. The diurnal fluctuation in water temperatures is reported to be as much as 14.4°F (8°C). Of the three largest tributaries (Big Grizzly, Freeman and Cow), Big Grizzly has the highest daytime water temperatures and the lowest amount of shade; both attributed to a lack of riparian canopy (Schatz n.d.).

Golden shiner (*Notemigonus chrysoleucas*) is the most common nongame fish, and a USFS stream survey along upper Big Grizzly Creek listed golden shiner as the dominant species. Rainbow trout is the most common game fish caught in Big Grizzly Creek. Occurrences of smallmouth bass (*Micropterus dolomieu*) and brown trout (*Salmo trutta*) have also been documented.

Electrofishing in September 1999 captured 140 rainbow trout from Old House Creek (DFG 2000). Outmigrant trapping conducted in late summer 1982 captured 74 rainbow trout fry less than 1.5 inches in length and 41 young of year 1.5 to 3 inches in length. A total of 63 golden shiner were also captured during this sampling.

Schatz (n.d.) reported that there was apparent habitat damage due to livestock grazing. In a stream survey of the northern reach of Big Grizzly Creek conducted by the Forest Service (1973), caddisflies, stoneflies, and diptera were all commonly found macroinvertebrates, while mayflies and beetles were less common in the lower reach of Big Grizzly Creek. In the upper reach, mayflies, stoneflies, and beetles were the most common macroinvertebrates, with fewer occurrences of caddisflies and dipterans.

Freeman Creek

Freeman Creek is also third order stream which empties to the north-west side of Lake Davis. Much of the information provided below is from surveys conducted in the 1970s and 1980s, and so is quite dated. Current conditions may differ somewhat from those reported here.

Freeman Creek has a diversity of habitats including pine/fir timberlands and hardwood riparian areas that provide ample overhead cover and stream shading; there are also large sections of gravel beds (Schatz n.d.). Rainbow trout, black bullhead, and golden shiners have been observed in Freeman Creek; and brook trout have been found in its headwaters (Schatz n.d). Stream surveys conducted by the Forest Service reported that stoneflies were common and mayflies were present in the lower reach of Freeman Creek (USFS 1973). The middle section had an abundant population of mayflies and few stoneflies. The upper reach of Freeman Creek was dry at the time of the survey, and only water striders (*Gerris* sp.) were noted as being present.

Of the three main tributaries, Freeman Creek appears to be the most productive for trout (Ratcliff 1982). In April 1992, 16 rainbow trout ranging in length from about 12 to 16 inches were observed. Also observed at this time were 62 redds and another 22 possible redds. The redds were located in cleaned gravel pool tail-outs and riffle/run with good velocity and about 0.5 to 1 foot in depth. These redds were generally close to cover. It appeared that the majority of spawning had occurred by the time these observations were made (Lake Davis Fisheries 1992). Outmigrant trapping at this time captured nearly 1,200 fry, less than 1.5 inches in length; and about 200 young-of-year, 1.5 to 3 inches in length. Over 600 juvenile trout were observed in Freeman Creek during a visual survey in 1981 (Ratcliff 1982). Thus, it appears that Freeman Creek may provide some natural recruitment to Lake Davis.

Cow Creek

Cow Creek is the smallest of the three main tributaries to Lake Davis. Of the three main tributaries, Cow Creek had the lowest daytime water temperatures, the most cover, and the best apparent trout habitat (with the impact of livestock grazing taken into account (Schatz n.d.).

The stream/riparian habitat for Cow Creek has a greater diversity than Big Grizzly Creek. Pine/fir timberland cover about 1.6 miles (2.5 km) in the upper headwaters, with about 2.2 miles (3.5 km) of alpine meadows interspersed with stands of pine/ and then about 1 mile (1.5 km) of open sagebrush flats and alpine meadows near the mouth (Schatz n.d.). Large gravel beds in Cow Creek serve as spawning grounds for trout. During surveys in 1983/84, most trout were caught in early July in 1983 and late July/early August in 1984 (Schatz n.d.). There is a small culvert barrier on Cow Creek, but it is reported to be passable to trout, with a jump of less than 1 foot and flows that do not create excessive velocities in the culvert for large fish (Lake Davis Fisheries 1992).

Outmigrant trapping, conducted in late summer 1982, captured 50 rainbow trout fry less than 1.5 inches in length and 5 young of year 1.5 to 3 inches in length. Only 2 golden shiner were captured during this sampling (Radcliff 1982). No USFS stream surveys were conducted on Cow Creek.

Big Grizzly Creek Downstream of Lake Davis

Annual standing stock surveys have been conducted periodically by the DFG at four locations between Grizzly Valley Dam and the confluence with the Middle Fork Feather River between 1997 and 2004. Data compiled from these yearly reports are summarized in Table 7.1-4. The number of brown trout captured in this reach varied from 75 to 239 individuals (mean yearly estimate is 137.25 individuals). Rainbow trout estimates varied from 75 to 266 (mean yearly estimate is 134 individuals). The number of rainbow trout was not reported in 1999. Black bullhead, largemouth bass, green sunfish, and Sacramento sucker were documented to be present in this stream reach: however, numbers of fish were not reported.

Table 7.1-4. Fish Composition and Abundance in Big Grizzly Creek below Lake Davis, 1997–2004[1]

Species\Year	2004	2003	2002	2001	2000	1999	1998	1997	Mean
Rainbow Trout (*Oncorhynchus mykiss*)	114	131	104	75	83	N/A	165	266	134
Brown Trout (*Salmo Trutta)*	145	75	137	239	112	133	168	89	137
Largemouth Bass (*Micropterus salmoides*)	0	0	0	0	>1	>1	>1	>1	N/A
Black Bullhead (*Ameiurus melas*)	0	0	>1	>1	0	0	0	0	N/A
Green Sunfish (*Lepomis cyanellus*)	0	0	>1	0	0	0	0	0	N/A

Table 7.1-4. Fish Composition and Abundance in Big Grizzly Creek below Lake Davis, 1997–2004[1]

Species\Year	2004	2003	2002	2001	2000	1999	1998	1997	Mean
Sacramento Sucker (*Catostomus occidentalis*)	>2	>1	>2	>2	>1	>1	>1	>1	N/A

[1] Brown 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005.

The DWR conducted an instream flow study on Big Grizzly Creek below Lake Davis in the early 1980s (Haines 1982), following the general procedures in the habitat module of the Physical HABitat SIMulation (PHABSIM) programs (Stalnaker, et al. 1995) using representative reaches of stream (Bovee 1982). This study evaluated velocity, depth, and substrate using habitat suitability criteria available at that time. Flow-habitat relationships were developed for adult, juvenile, and fry rainbow and brown trout at flows of 5, 8.5, 15, and 22.6 cfs (Haines 1982). Because this study was empirical (based on measured values of depth, velocity, and substrate at specific flows, with no hydraulic modeling done, the results of this study can only be used to evaluate habitat flow relationships within the range of flows studied.

The results of this study indicate that adult habitat for both trout species improves rapidly with increasing flow up 22.6 cfs, the highest measured value, while habitat for juvenile and fry of both species remains relatively stable, with a slight peak at about 15 cfs (Haines 1982).

Middle Fork Feather River

The reach from Portola to Sloat is dominated by Sacramento sucker, carp and pikeminnow (DFG 1982). Habitat is characterized by long, shallow pools and short riffles, low summer flows, and high summer water temperatures.

The Middle Fork Canyon extends from about 1 mile below Sloat to Lake Oroville. Habitat is typified by high quality pools and abundant riffles. Water temperature is generally less than 70°F (21°C) because of the influence of numerous cold tributaries.

This portion of the stream is managed for wild trout and was considered one of the finest resident trout streams in California. Rainbow trout were the dominant species and brown trout were present. Low numbers of pikeminnow, sucker, and carp were also present.

Habitat-flow relationships were developed for the Middle Fork American River near Portola by the DWR using the same techniques described above for Big Grizzly Creek below Lake Davis (Haines 1982). Habitat was evaluated for fry, juvenile, and adult rainbow and brown trout at flows of 8.8, 14.5, 27.5, 36, 46, and 58 cfs. This study found that adult habitat increased continuously with flow over this range. Fry and juvenile habitat remained relatively constant, with a slight peak at 36 cfs.

7.1.1.7 Regulatory Environment

Federal

Endangered Species Act of 1973 (16 USC §1531 et seq.; 50 CFR Parts 17 and 222)

This law includes provisions for protection and management of species that are federally listed as threatened or endangered and designated critical habitat for these species. This law prohibits "take" of federally listed species, except as authorized under an incidental take permit or incidental take statement. USFWS is the administering agency for this authority for freshwater species.

Plumas National Forest Land and Resource Management Plan

The 1988 United States Forest Service Plumas National Forest Land and Resource Management Plan (PNF LRMP) provides guidance on efficient use and protection of forest resources. These forest resources include wilderness, rangeland, timber, recreation areas, facilities, and wildlife. Wildlife management goals include providing habitat to encourage viable populations of endangered or sensitive species, improving and protecting habitat for selected special species, protecting and encouraging diversity of plant and animal communities, and maintaining viable populations of all native vertebrate species. These native vertebrate populations are monitored through the use of management indicator species (MIS) representative of specific habitat types and, therefore, entire wildlife communities. The 2004 SNFPA ROD amended the PNF LRMP.

State

California Fish and Game Code §1600, et seq.

This law provides for protection and conservation of fish and wildlife resources with respect to any project that may substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. The administering agency is the DFG.

California Endangered Species Act of 1984 (California Fish and Game Code §2050-2098)

This law provides for the protection and management of species and subspecies listed by the state of California as endangered or threatened, or designated as candidates for such listing. They are listed at 14 CCR §670.5. This law prohibits "take" of state listed or candidate species, except as otherwise authorized by the Fish and Game Code. (The term "take" is defined by Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." This definition is different in some respects from the definition of "take" under the Federal Endangered Species Act.) The administering agency is the DFG.

California Fish and Game Code §5501

This law authorizes the DFG to take any fish which, in its opinion, is unduly preying upon any bird, mammal, or fish.

California Fish and Game Code §5650

This law protects water quality from substances or materials deleterious to fish, plant life, or bird life. It prohibits such substances or materials from being placed in waters or places where it can pass into waters of the state, except as authorized pursuant to, and in compliance with, the terms and conditions of permits or authorizations of the State Water Resources Control Board or a regional water quality control board such as a waste discharge requirement issued pursuant to Section 13263 of the Water Code, a waiver issued pursuant to Section 13269(a) of the Water Code, or permit pursuant to Section 13160 of the Water Code. The administering agency for FGC section 5650 is the DFG.

California Fish and Game Code §5937

This law requires a dam owner to allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, sufficient water to pass over, around or through the dam to keep in good condition any fish that may be planted or exist below the dam. The administering agency is the DFG.

7.1.2 Environmental Impacts and Consequences

This section describes the standards by which project alternatives will be evaluated for the purposes of the EIR/EIS.

7.1.2.1 Evaluation Criteria and Environmental Concerns

This section presents the significance criteria used to evaluate the likely impacts of the various project alternatives under CEQA and identifies the environmental issues. The significance criteria establish thresholds for determining whether an impact rises to a level that is biologically significant. The environmental issues describe the mechanisms by which such impacts might occur.

Significance Criteria

Significance criteria were developed based on applicable regulations and management policies, a review of the available information, and the professional judgment of the authors.

The mandatory findings of significance as explained in CEQA, Pub. Res. Code sec. 21083; guidelines sec. 15065, indicate that a project will have a significant effect on biological resources if it will:

- Substantially degrade environmental quality;
- Substantially reduce fish or wildlife habitat;
- Cause a fish or wildlife habitat to drop below self-sustaining levels;

- Threaten to eliminate a plant or animal community; or
- Substantially reduce the numbers or range of a rare, threatened, or endangered species.

Additional thresholds of significance for biological resources under CEQA have been used in the following evaluation. Impacts were considered significant if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or by the USFWS or by the USFS;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

The CEQA Standards of Significance have been adapted to Lake Davis project specific criteria to assess potential impacts to desirable fish and macroinvertebrates. An alternative will have a significant effect on biological resources if it would:

- *Have a substantial adverse effect on a population of a desirable fish species for more than two years.* This relates to the fish management objectives for Lake Davis developed by the DFG;
- *Have a substantial adverse effect on populations of special status macroinvertebrate species.* This relates to management objectives of state and federal agencies regarding species of concern (State of California) or sensitive species (USFS);
- *Result in more than a 50 percent reduction of benthic macroinvertebrate indices (BMI) for more than two years after the treatment.* This relates to the protection and re-establishment of aquatic communities within the project area; or
- *Result in loss of any macroinvertebrate species for more than two years.*

The pike eradication project would have short-term impacts on fish and macroinvertebrates and their habitat within the project area as described in the subsequent sections. The timeframe of two years after treatment is based on allowing two seasons for the reservoir to refill and populations and communities to return to pre-treatment levels. This timeframe is used to differentiate between short-term and long-term impacts under CEQA. The re-establishment criteria for aquatic macroinvertebrates recognize the natural variability of these populations and the variability inherent in the indices commonly used to evaluate differences in their community structures. It also acknowledges the potential for the treatment to result in the unintentional elimination of species from the project area, because of the extent of the

area being treated and the potential for some of these species to occur within a very confined geographic range. These levels are discussed in more detail in the evaluation of the impacts of the Proposed Project alternative.

Environmental Concerns

There are several aquatic resource concerns regarding the Proposed Project and the alternatives. These aquatic resource concerns include the potential for the escape of pike to the Central Valley; the temporary loss of aquatic habitat in Lake Davis; the application of harmful chemicals into Lake Davis and its tributary streams and springs; release of these chemicals to Big Grizzly Creek downstream of Lake Davis; the change in flow regime to Big Grizzly Creek downstream of Lake Davis and the Middle Fork Feather River; dewatering the reservoir, tributary streams and springs, and Big Grizzly Creek downstream of Lake Davis; and the accidental spill of chemicals into the environment. These issues are described briefly below.

Lowering Lake Davis

This issue relates to the effects of temporarily reducing fish and invertebrate habitat within the reservoir. Lowering the reservoir beyond its normal range of operation would reduce habitat in the reservoir and could reduce the ability of fish to access tributary streams. Lowering the reservoir would also concentrate fish and zooplankton within a relatively small volume of water and expose a large portion of the littoral area to desiccation.

Reinundation of one-half the littoral habitat within the reservoir within two years is used as one threshold for recovery of the reservoir littoral communities. The estimated amount of available littoral habitat within Lake Davis is based on a reservoir elevation of 5,763.5 feet (45,000 acre-feet, 2,838 acres) and the expected depth to which light penetration will allow plants to grow (15 feet). Given this starting point, the littoral zone extends down to an elevation of 5,748.5 feet and would cover about 1,550 surface acres. Half of this area (775 acres) would need to be reinundated to meet this threshold for recovery. This corresponds to a target elevation for refill following treatment of 5,756 feet or a volume of 27,000 acre-feet. This elevation is considered conservative as the littoral community is expected to colonize deeper areas within the reservoir during drawdown, and some of the loss of littoral habitat would be offset by this colonization. This is not incorporated in the calculation above, because it is uncertain how quickly and how much of the deeper habitat would be colonized.

The time to a 75 percent likelihood of refill to 27,000 acre-feet for the four alternatives that involve drawdown below this level is shown in Figure 7-2. This information is used in the evaluation of impacts to littoral macroinvertebrate communities within Lake Davis.

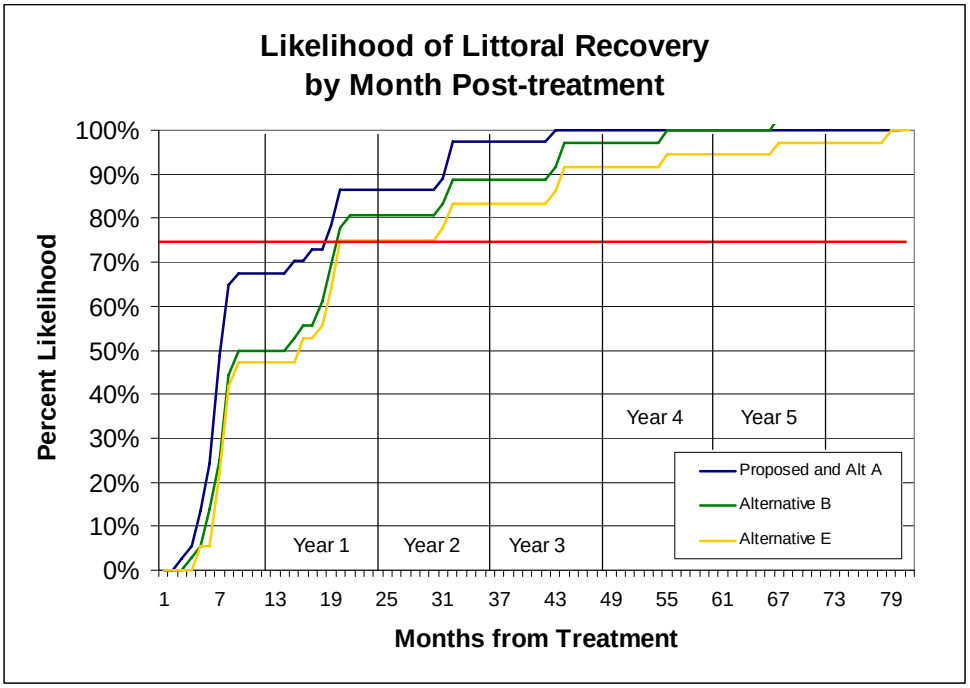

Figure 7-2 Time to a 75 Percent Likelihood of Reservoir Refill to 27,000 Acre-Feet for Littoral Zone Recovery

Rotenone Treatment of Lake Davis

Each of the project alternatives, except Alternative E and the No Project alternative, would result in a rotenone formulation being applied to all waters within the basin suspected to be capable of supporting any life stage of pike. Treatment of Lake Davis with rotenone at the concentrations discussed in Section 2, Project Alternatives, would directly affect fish and aquatic invertebrate populations and community structure. The toxicity of rotenone to various organisms is described in Section 14, Human and Ecological Health Concerns, and Appendix J.

The effects of the rotenone treatment on the aquatic resources in the project area are assessed based on potential impacts to desirable fish species and macroinvertebrate communities, loss of individual taxa, and on anticipated re-establishment times based on previous studies.

Rotenone Treatment of Tributary Streams

Each of the project alternatives, except Alternative E and the No Project alternative, would result in rotenone being applied to all streams tributary to Lake Davis that are flowing or which contain residual water at the time of the treatment. This is anticipated to be lethal to all pike and most trout present. Bullhead and other warmwater species are less sensitive to rotenone and may survive. Many macroinvertebrate species are expected to survive, but for many species, at least some life stages are expected to be killed.

The stream environment supports a different macroinvertebrate community than the reservoir, including special status macroinvertebrate species. The effects are assessed based on potential impacts to desirable fish species, special status invertebrate species, invertebrate communities, loss of individual taxa, and on anticipated re-establishment times based on previous studies.

Rotenone Treatment of Springs and Other Waters

Each of the project alternatives, except Alternative E and the No Project Alternative, would result in rotenone being applied to all springs and other waters tributary to Lake Davis that are flowing or contain residual water at the time of the treatment. This is anticipated to be lethal to all pike and trout (although other fish species may survive), and to at least some life stages of many macroinvertebrates.

Springs have different physical and biotic characteristics than the reservoir or streams, and so the effects may differ. This issue addresses the consequences of the application of rotenone on desirable fish species, special status invertebrate species, invertebrate communities, loss of individual taxa, and on anticipated re-establishment times based on previous studies.

Increased Flow in Big Grizzly Creek Below Lake Davis During Drawdown

The drawdown of the reservoir would result in higher flows being released into Big Grizzly Creek downstream of Lake Davis. A prolonged period of high flows would adversely affect the age structure of fish populations and alter the composition of macroinvertebrate communities.

Neutralization of Rotenone at Lake Davis Outlet

This concern examines the potential impacts of the four options for neutralizing rotenone in water discharged from Lake Davis. Release of rotenone, or overdosing with potassium permanganate, would adversely affect fish and macroinvertebrate communities downstream.

Reduced Flow in Big Grizzly Creek below Lake Davis during Treatment

This concern evaluates the potential impacts of curtailment or reduction of flows in Big Grizzly Creek during and following reservoir treatment. This would occur in all of the treatment alternatives and could affect desirable fish and macroinvertebrates.

Flow Effects on Middle Fork Feather River

This concern evaluates the effect of flow changes resulting from drawdown and treatment on fish and macroinvertebrates in the Middle Fork Feather River downstream of the Big Grizzly Creek confluence. Changes in flow could affect desirable fish and macroinvertebrate communities.

Complete Dewatering of the Reservoir

This concern addresses the impacts of complete dewatering of the reservoir, described under Alternative E, on desirable fish and macroinvertebrate communities in Lake Davis. This evaluation parallels that of lowering Lake Davis, above, but is more extreme.

Dewatering the Tributary Streams

This concern discusses the impacts of complete dewatering of the tributary streams on desirable fish species, special status macroinvertebrates, and macroinvertebrate communities. This is anticipated to have different impacts than the application of rotenone.

Dewatering Springs and Other Waters

This concern relates to the impacts of the complete dewatering of springs and other waters on desirable fish species, special status macroinvertebrates, and macroinvertebrate communities. This is anticipated to have different impacts than the application of rotenone.

Accidental Spill of Harmful Chemicals

This concern evaluates the potential for spill of harmful chemicals on aquatic ecosystems, including rotenone, potassium permanganate, and automotive chemicals. This issue is evaluated with regard to its potential impacts on desirable fish species, special status invertebrate species, and macroinvertebrate communities.

7.1.2.2 Evaluation Methods and Assumptions

Impacts are evaluated with regard to desired fish species (e.g. trout), special status macroinvertebrate taxa, macroinvertebrate communities, and the potential for loss of macroinvertebrate species, using the criteria described above. Potential impacts were assessed using available information on rotenone toxicity, treatment, and community response and re-establishment from published and gray-literature, as cited in the text. This information was evaluated in the context of the treatment alternatives and the existing environment in the project area as described in Section 7.1.1.

7.1.2.3 No Project/No Action

Existing measures to control pike populations and prevent movement out of the Lake Davis watershed would be continued. However, their numbers have continued to grow in recent years in spite of these measures. They would eventually become the dominant species in the reservoir. They may eventually extirpate most other fish species, as has been observed in systems in Alaska and Nevada, where they have been introduced. They may also significantly impact amphibian populations and invertebrate communities.

As described in Section 1.1.3, Mechanisms of Escape and spread from Lake Davis, if they are not eradicated from Lake Davis, pike would eventually be spread to other waters within the state, either by escape over the spillway, or through intentional or unintentional human mechanism. Their escape through the dam outlet would be prevented by the containment

project strainers the DWR is installing on the outlet to the dam, as long as these strainers operate as planned and do not clog or otherwise fail. While measures can be implemented to reduce the likelihood of pike escaping the reservoir through spill or human mechanism, these measures are eventually going to be insufficient or circumvented. The escape of pike would have serious, irreversible, and unmitigable environmental impacts in the aquatic ecosystems where they become established, especially in the Central Valley.

Should pike become established in waters downstream of Lake Oroville, they would affect a number of species whose numbers have already declined significantly, as well as many other species which are vulnerable to predation by pike (Maniscalco and Morrison 2006, Appendix A). Most significantly these include Chinook salmon, steelhead, delta smelt, and splittail. With the exception of fall-run Chinook salmon, the populations of all of these species are currently in peril, even without the presence of pike in the Delta (Moyle 2002).

Under the No Project alternative, pike would eventually escape from Lake Davis and become established in other waters of the state. This impact would be significant and could not be mitigated.

Under the No Project alternative the adverse effects that fish, macroinvertebrate, and amphibian communities are experiencing in Lake Davis would continue and become even more substantial. Under this alternative pike populations would continue to increase. They would continue to feed on fish and amphibians, and when these resources were depleted, they would then feed on macroinvertebrates. This impact would be significant and could not be mitigated.

7.1.2.4 Proposed Project/Proposed Action: 15,000 Acre-Feet (Plus Treatment)

Lowering Lake Davis

The Proposed Project would result in the volume of Lake Davis being reduced to 15,000 acre-feet. Based on historic operations and runoff patterns, drawdown of Lake Davis[1] for this alternative could be completed by August 1 to October 1 of the same calendar year (the timeframe allowing treatment to occur) in 89 percent of years (34 of 38 years). With supplemental pumping this could be achieved in 95 percent of years.

The drawdown of the reservoir could reduce the ability of fish to access the tributary streams, potentially preventing trout from moving upstream into the tributaries, where they spawn. It is unknown whether any passage barriers might be exposed on the tributary streams as the reservoir is drawn down, although they are not expected to. This effect could occur anytime from when drawdown begins to the time the reservoir is refilled to 48,000 acre-feet. Depending on the duration of the drawdown, this could affect both rainbow and brown trout. This effect is considered insignificant with respect to the anticipated effect of the rotenone or dewatering.

[1] Drawdown estimates are based on a starting volume of 45,000 acre-feet on January 1. See Appendix D for a description of the DFG's reservoir drawdown and refill model.

The limnetic (zooplankton) and fish communities are expected to migrate with declining water levels. They are not anticipated to be directly affected by drawdown, because the reservoir would be lowered at a rate slow enough to prevent stranding. They may however, be affected by increased predation and competition resulting from crowding if drawdown levels are large. These effects are insignificant relative to those from the subsequent rotenone treatment or complete dewatering of the reservoir.

The drawdown of the reservoir would expose some amount of the littoral areas of the reservoir. This area would be exposed until at least the following spring run-off period, and thus be subject to freezing. This effect would not be cumulative with the rotenone treatment, as these areas will not be treated, except for remaining pockets of water. Littoral zones are important production areas for aquatic plants and algae, invertebrates, and fish spawning and rearing.

Lake Davis has a gently sloping bed over much of its area and aquatic vegetation has been reported to cover most of the surface of the reservoir (DFG 2005d). In addition, rooted aquatic vegetation has been reported to cover almost the entire area less than 15 feet deep (DWR 1971). Drawdown is expected to be sufficiently slow from January through May (1 to 3 feet per month) to allow aquatic vegetation to colonize areas below the littoral zone. Areas deeper than 15 feet would have 3 to 4 months to be colonized. Additionally, the tributary streams are reported to support aquatic vegetation and algae that may aid in recovery. These areas would provide sources for recolonization of dewatered areas. After June the drawdown rate increases (to an average of 5 to 13 feet per month, and potentially more than 15 feet per month). This may not allow sufficient time (possibly less than 1 to 2 months) for colonization of still deeper areas to occur.

Aquatic plant communities are expected to re-establish quickly if the reservoir is not drawn down for more than two years, as many of these species have adaptations that allow them to survive for substantial periods in exposed sediments. Pondweeds and arrowhead, for example, have subterranean tubers and rhizomes that can survive a year or two in a dormant state in the substrate. Seeds in the substrate can also survive desiccation. Additionally, Vernieu (1997) found that reservoir drawdown in Lake Powell resulted in a period of increased productivity when the reservoir was refilled. This type of effect may facilitate rapid re-establishment of the vegetation within Lake Davis, as well. There is a 75 percent likelihood that the reservoir would be refilled to the target level for the littoral zone (27,000 acre-feet) by 18 months post treatment, therefore the plant community would be expected to re-establish within two years.

Littoral invertebrate communities within the reservoir would be impacted by drawdown of the reservoir. Since Lake Davis is an artificial ecosystem, the taxa present colonized from elsewhere historically and are not considered unique to the reservoir. Any taxa that are extirpated by the treatment should be able to recolonize the reservoir after treatment using mechanisms similar to those which resulted in their original colonization, when the reservoir was first filled or subsequent to the 1997 treatment. The timeframe for their re-establishment depends on re-establishment of the littoral plant community and on recolonization of the exposed habitat. These areas would be recolonized from areas treated with rotenone which may in itself take longer than two years. Therefore, re-establishment of this community may take longer than two years.

There are several other mechanisms that would reduce the impacts of drawdown. These organisms would be expected to colonize deeper areas of the reservoir during the drawdown period. Within the littoral invertebrate community, many species have life-history strategies that allow them to survive and re-establish from periods of desiccation. This includes terrestrial adult life stages, ability to move with the declining water levels, eggs that are resistant to desiccation, or burrowing behavior. Others may not have such strategies available to them and may be dependent upon recolonization from other areas that are not subjected to the drawdown. No special status invertebrate species are known to exist or are thought to potentially exist within the reservoir. No information is available on the re-establishment time of invertebrate communities in reservoirs from drawdown.

There is a 75 percent likelihood that the reservoir would refill to the 45,000 acre-feet level by June of the second year after treatment. About half the time the reservoir would refill from the treatment level to 45,000 acre-feet by June 1 of the year following treatment. There is a 75 percent likelihood that the reservoir would be refilled to the target level for the littoral zone (27,000 acre-feet) by 18 months post treatment.

Impact AR-1: The impacts of the Proposed Project would be significant but mitigable on desirable fish species.

Mitigation AR-1: Restock the reservoir following the recommendations in the California Department of Fish and Game Fisheries Management Plan, Appendix G, to restore these fisheries following drawdown and treatment.

Impact AR-2: The Proposed Project would have a less than significant impact on special status macroinvertebrate species, because none are known or suspected to occur in Lake Davis.

Mitigation AR-2: No mitigation is required.

Impact AR-3: The impacts of the Proposed Project would be considered significant and unavoidable on the littoral macroinvertebrate communities, but less than significant on the limnetic (zooplankton) communities. The timeframe required for the littoral invertebrate community to re-establish may exceed two years, based on monitoring following the 1997 treatment.

Impact AR-4: The Proposed Project may result in the loss of one or more species, as not all species may be observed in sampling within 2 years after treatment (DFG 2006d). There are no known mitigation measures to offset this impact. This impact would be significant and unavoidable.

No feasible measures are available to effectively reduce impacts to invertebrate communities over such a large area. The refill rate of the reservoir is entirely dependent on precipitation following the treatment. Delaying fish restocking would speed the re-establishment of the zooplankton community. However, it is not expected to benefit the littoral community, as trout feed preferentially on zooplankton, which would re-establish much more quickly than the littoral community.

Treatment of Lake Davis

Lake Davis would be treated with rotenone, which is expected to kill all pike and trout within the reservoir (Appendix J, Sections J.3.4 and J.5.1, Section 14). The treatment would greatly reduce limnetic populations, and substantially reduce littoral invertebrate abundance.

None of the fish present in the area are special status species. Rainbow trout are the principal management species and were the only species present in Lake Davis and its tributaries prior to construction of the dam (DFG 2003b). They are supported by hatchery production rather than natural recruitment. There are no unique strains of rainbow trout known within the system. None of the other species present are native to California. Brown and brook trout are also planted within the system. Other species found in the reservoir include pike, brown bullhead, largemouth bass, golden shiner, pumpkinseed.

Following treatment, the reservoir and its tributaries would be managed according to the Fisheries Management Plan (Appendix G). This plan calls for the reservoir to be restocked with rainbow and brown trout, and the tributaries would be restocked with rainbow and potentially brook trout. Some warmwater fish species would continue to be present in the reservoir, although some may be extirpated.

The removal of other fish species may provide some increase in trout production and return to the creel. This effect was noted following the 1997 treatment, although the effect did not last long, possibly because other introduced species soon reestablished within the reservoir, either from survivors of the treatment, recolonization from upstream, or through illegal introduction.

Rotenone is expected to substantially reduce zooplankton (limnetic community) abundance for several months. During the 1997 treatment, taxa richness remained similar throughout the monitoring period. Overall abundance was reduced to nearly nothing immediately after the treatment, but rebounded to more than three times its original density within nine months after the 1997 treatment (DFG 2006d). Beal and Anderson (1993) reported that zooplankton was almost completely eliminated within 48 hours of a rotenone application, but recovered within 8 months. In a prairie wetland, a fall rotenone application resulted in a large decrease in zooplankton abundance, although effects on littoral invertebrates were not significant. Zooplankton communities had re-established by the following spring (Melass et al. 2001). Kiser et al. (1963) report similar results as the aforementioned studies, with zooplankton populations returning to pretreatment levels in about 3 to 4 months and no loss of taxa. They note that the presence of heavy vegetation may adsorb and breakdown rotenone more quickly and thus provide refugia for invertebrates and potentially fish larvae. The foregoing review of past studies indicates that zooplankton communities would re-establish quickly after treatment.

As an option to assist in the re-establishment of the zooplankton population, Beal and Anderson suggest that restocking with fish should be delayed until zooplankton populations recover, especially if planting with fry or species that depend heavily on zooplankton.

Littoral invertebrate communities experience a smaller initial effect than the zooplankton community (Melass et al. 2001, DFG 2006d), but appear to take longer to re-establish (DFG 2006d). Delaying stocking is not expected to benefit the littoral community to any great

degree, as trout will feed preferentially on zooplankton, which are expected to re-establish more quickly.

Based on monitoring studies conducted following the 1997 treatment, littoral invertebrate communities had not completely re-established after nearly two years. While the number of taxa increased, the total number of organisms after treatment remained lower than that observed before of treatment. This result, however, is based on a single pre-treatment sampling event. The period followed a reduction of water level within the reservoir during the preceding month. Invertebrates may have moved down with the declining water level and been concentrated within the area sampled. Invertebrate abundance also fluctuates widely in both space and time. It is unknown where either the pre-treatment or post-treatment numbers lie within the range of normal variability. Because of these factors, it is difficult to determine if the community was still being impacted by the treatment, but in the absence of better information, it is assumed that it was.

Since Lake Davis is an artificial ecosystem, the taxa present colonized from elsewhere historically and are not considered unique to the reservoir. Any taxa that are extirpated by the treatment should be able to recolonize the reservoir after treatment using mechanisms similar to those which resulted in their original colonization, when the reservoir was filled or subsequent to the 1997 treatment.

Based on the discussion above, the effects of the rotenone treatment are not anticipated to affect any special status species and are expected to be short-term, with re-establishment occurring within a few months to two years.

Impact AR-5: The Proposed Project would have significant but mitigable impacts to desirable fish species.

Mitigation AR-5: Implement the Fisheries Management Plan (Appendix G).

Significance After Mitigation: Less than significant.

Impact AR-6: The impact of the Proposed Project on special status invertebrate species would be less than significant, as none are known or suspected to occur in Lake Davis.

Mitigation AR-6: No mitigation is required.

Impact AR-7: The Proposed Project would have significant and unavoidable impacts to littoral invertebrate communities, as the time for these communities to fully re-establish may exceed two years and no effective mitigation measures are known. Impacts to zooplankton communities would be less than significant.

Impact AR-8: The Proposed Project may result in the loss of one or more species, as not all species may be observed in sampling within two years after treatment (DFG 2006d). There are no known mitigation measures to offset this impact. This impact would be significant and unavoidable.

No feasible options are available to effectively reseed invertebrate communities over such a large area. The refill rate of the reservoir would be entirely dependent on precipitation following the treatment. Not restocking for a period while the zooplankton population recovers would speed the recovery of this community. However, it is not expected to benefit the littoral community, as trout would feed preferentially on zooplankton, which will re-

establish much more quickly than the littoral community. There are no known measures that might prevent the loss of individual species.

Treatment of Tributary Streams

The tributaries to Lake Davis would be treated with liquid rotenone. The rotenone treatment is expected to kill all pike and trout in the tributary streams, although some warm water fish species may survive (Appendix J, Human Health and Ecological Risk Assessment, Sections J.3.4 and J.5.1.3).

Fish Populations

None of the fish present in the tributaries are special status species. Rainbow trout are the principal management species and were the only species present before the construction of the Grizzly Valley Dam. The current fishery in the tributaries is supported by hatchery production rather than natural recruitment. There are no unique strains of rainbow trout known within the system. Brown and brook trout are not native to California and are also planted within the Lake Davis system.

Following treatment, the tributaries would be managed according to the Fisheries Management Plan (Appendix G). This plan calls for the tributaries to be restocked with rainbow and/or brook trout, depending on location.

Macroinvertebrate Communities

Stream macroinvertebrate communities tend to be more tolerant of rotenone than most fish species, but are still impacted by rotenone treatment (Appendix J, Human Health and Ecological Risk Assessment, Section J.3.4). Overall abundance is expected to be decreased by 20 (Engston-Heg et al. 1978) to 85 percent (Darby et al. 2004), community structure is expected to change, and diversity is expected to be substantially decreased (Binns 1967, Cook and Moore 1969, Engstrom-Heg et al. 1978, Maslin et al. 1988a, 1988b, Mangum and Madrigal 1999, Trumbo et al. 2000a, 2000b, Whelan 2002, Darby et al. 2004). Most authors report that the mayfly, stonefly and caddisfly families (Ephemeroptera, Plecoptera and Trichoptera, often referred to as the EPT taxa) are among the least tolerant to rotenone. The sensitivity of individual species and life histories to rotenone appears to be related to their oxygen requirements (Engstrom-Heg et al. 1978). There may be a wide variation in rotenone tolerance even within the same family. Whelan (2002) reported that while the caddisflies (Order Trichoptera) had the highest number of species affected by rotenone, a high proportion of the species that were tolerant of rotenone were also from this order.

The effect of rotenone treatment on stream macroinvertebrate communities is dependent on a number of factors including the rotenone concentration, duration, and number of treatments made, geographic extent of treatment, availability of refugia within or near the treatment area, ambient conditions when the treatment is made (temperature, turbidity, vegetation, and alkalinity), the community affected (proportion of tolerant vs. non-tolerant species), and the presence of more resistant or unaffected life stages such as eggs or emergent adults at the time of treatment (Mangum and Madrigal 1999, Whelan 2002, Darby et al. 2004).

Various studies have used different levels of taxonomic identification (family, genus, species) in evaluating the impacts and "recovery." "Recovery" in this context means re-establishment of the community and taxa to levels approximating those prior to treatment. These studies have also focused on different aspects of community structure. Some authors have focused on the overall abundance and biomass of the community and different groups within the community (Binns 1967, Cook and Moore 1969, Engstrom-Heg et al. 1978). Others have focused community indices such as taxa richness or other diversity indices, the EPT Index, Biotic Condition Factor (BCI), and others (Maslin et al. 1988a, 1988b, Trumbo et al. 2000a, 2000b, Whelan 2002, Darby et al. 2004). Mangum and Madrigal (1999) focused solely on the presence or absence of the species present before the treatment. Most other authors used some combination of these metrics.

These studies indicate that "re-establishment" may occur in as little as two months, but may take more than five years (Table 7.1-5). The various authors define re-establishment differently (as described above), making comparison among re-establishment times difficult. Comparison is also limited by the specific treatment implemented and the presence of other factors that may contribute to the impact or slow re-establishment. Another factor contributing to difficulty in assessing re-establishment is the highly variable nature of macroinvertebrate communities in both time and space, insufficient monitoring of pretreatment communities (usually limited to one or two samplings immediately before the treatment), and lack of adequate controls or reference sites (Whelan 2002). Longer periods of pre-treatment monitoring and simultaneous monitoring of treated and comparable reference sites post-treatment would provide better information on the natural variation that occurs in invertebrate communities over time.

Table 7.1-5. Time to Re-establishment from Rotenone Treatments

Study	Time to Re-establishment
Cook and Moore (1969)	2 months
Engstrom-Heg et al. (1978)	Little effect, a few months
Maslin et al. (1988a)	5 months
Trumbo et al. (2000a, 2000b)	1 year
Binns (1967)	14 to 24 months
Whelan (2002)	1 to 3 years
Darby et al. (2004)	More than 3 years
Mangum and Madrigal (1999)	More than 5 years

The re-establishment criteria for aquatic macroinvertebrates must recognize the natural variability of these populations and the variability inherent in the indices commonly used to evaluate differences in their community structures (Resh and McElravy 1993). Various authors have indicated that anywhere from three to several thousand samples may be needed to distinguish a 100 percent difference between the means of two sets of samples. The average coefficient of variation (the variability among samples expressed as a percentage of their mean) of macroinvertebrate indices collected from streams in the Lake Davis watershed range from 12 to 52 percent, but the overall range of this variability ranges from 3 to

84 percent (Table 7.1-6, USFS data). Based on this, the community will be considered to have recovered if these metrics return to within 50 percent of their pre-treatment values.

Table 7.1-6. Observed Coefficient of Variation (Expressed as Percent of Mean) for Selected Macroinvertebrate Indices in Five Lake Davis Watershed Streams

	EPT Index	Simpson Diversity Index	Shannon Diversity Index	Standing Crop (g/m^2)
Average	32	32	13	53
Minimum	3	23	7	21
Maximum	68	40	22	84

The aquatic macroinvertebrate communities in the project area were subjected to a rotenone treatment in 1997. Pre-treatment surveys were made of the reservoir communities, but were not made of stream and spring communities. It is known that in the reservoir, all but two taxa were found again by two years after the treatment, but the total number of organisms was still reduced relative to pre-treatment samples. This is an artificial system and as such was colonized by species from the surrounding area and contained no endemic species. Because no pre-treatment sampling was done in streams or springs, it is unknown whether the treatment resulted in any loss of taxa from these waters.

Sampling conducted in the project area in 2005 and 2006 indicates that the macroinvertebrate communities are relatively healthy (G. Sibbald, pers. comm., June 2006). The stream and spring communities contain at least one California species of concern and potentially several others. They also contain hundreds of other species without legal designation.

In evaluating the effects of the treatment in this document, two criteria are used to assess re-establishment. The first relates to the re-establishment of ecological function. The second relates to the specific taxa present.

Ecological function refers to the processing of food and energy within the macroinvertebrate community. Stream macroinvertebrate communities are divided into several feeding guilds, or groups, that fill specific ecological niches (Merritt and Cummings 1996). These guilds include shredders, collector-gatherers, filter-collectors, scraper-collectors, and predators. Each of these guilds is made up of numerous species that perform a similar ecological function. Where all of these guilds are present in appropriate numbers and proportion, the ecological function of the system is maintained. This can be assessed through a number of benthic macroinvertebrate indices (BMI), such as those that are part of the California Stream Bioassessment Procedure (CSBP) (Harrington and Born 2003). To determine which indices will be used to define re-establishment of macroinvertebrate communities the DFG will use several widely used metrics (e.g. EPT, total taxonomic richness) which are generally good indicators of macroinvertebrate community characteristics (Karr and Chu 1999). In addition, the DFG will work with the aquatic entomologists working on the current BMI. Surveys and study designs to determine reasonable threshold values for re-establishment for the metrics used.

For the purpose of defining the re-establishment of ecological function after the Lake Davis treatment, the most applicable references are those of Trumbo et al. (2000a, 2000b) and Maslin et al. (1988a) which focus on re-establishment of various BMI to pre-project levels, although Maslin et al. (1988a) also looked at re-establishment of individual species and Trumbo et al. (2006b) evaluated the number of stonefly taxa present before and after treatment. These studies are located within the general proximity of Lake Davis (within 100 miles) and used similar rotenone concentrations and durations as those proposed for the Lake Davis treatment. Additionally, the treatment of Silver Creek (Trumbo et al. 2000b) involved treatment of the entire watershed. The macroinvertebrate communities in these systems recovered within approximately one year based on abundance and various biotic indices. Re-establishment after treatment would depend on presence and extent of untreated areas upstream of the treatment area, presence of taxa in eggs or as non-aquatic adults, and presence of nearby untreated refuge areas.

While the re-establishment of the ecological function is clearly important in returning the environment in the project area to its pre-treatment status, it is also important to consider what individual species may be lost through the treatment and their biological role and importance.

Substantial difficulties are encountered when considering the presence or absence of an individual taxon. Often these taxa are relatively rare to begin with, and macroinvertebrate sampling is conducted within limited space and time. Thus when a rare species is absent after treatment, it may not be clear whether this species was actually absent or was missed during sampling. It is also often unclear whether this is a species that would be expected to be encountered frequently or sporadically within the study area. Whelan (2002) describes that most of the species absent in Manning Creek after treatment were relatively rare in samples before treatment, that several species observed in the treated area several years before the treatment were missing immediately prior to treatment; and that some species that were missing in post-treatment samples were known to be present through other observations. Mangum and Madrigal (1999) who focused exclusively on the presence or absence of taxa, without regard to number, do not provide information regarding the relative abundance of the missing taxa in pre-treatment samples, or the likelihood that these taxa could have been present, but missed in post-treatment sampling. Nor do they have any information to assess the likelihood that these taxa may have disappeared through circumstances unrelated to the rotenone treatment.

Because the streams and springs in the Lake Davis project area may contain endemic species (species that evolved in the area and are not found anywhere else, except through introduction), loss of these species is of particular concern. In the tributary streams and springs, the presence of one caddisfly that is a California Species of Concern, three genera of caddisflies with undetermined species classification, and unidentified springsnails warrants particular consideration. The known Species of Concern is *Desmona bethula*, the amphibious caddis fly, collected from Big Grizzly, Old House and Cow creeks and two unnamed springs. The other three genera observed with individuals not identified to species include the species *Cryptochia excella*, *Lepidostoma ermanae*, and *Rhyacophila spinata*. None of these species has been listed under either the state or federal governments ESA statutes. The springsnails have only been identified to family at this time. Caddisflies are noted as being particularly

intolerant of rotenone, thus these species, if present, are expected be killed by the treatment (although some species apparently have greater rotenone tolerance (Whelan 2002). Springsnails are highly vulnerable to extirpation because they cannot readily disperse from one area to another and they reproduce only once. In anticipation of the treatment, the DFG is currently collecting additional information (inventory samples) to determine if these or other sensitive species of macroinvertebrates are present.

For the purpose of defining re-establishment of individual taxa, the DFG has established a criterion that the loss of any single macroinvertebrate species, regardless of any legal designation, for more than two years is considered a significant impact. A species would be considered to be "lost" if it has not been observed in post-treatment sampling within two years of the treatment date. Post-treatment sampling would parallel the pre-treatment sampling currently planned and underway. Biotic monitoring to assess functional re-establishment using the CSBP will be conducted immediately after and at one year post-treatment. Species inventory sampling to assess lost taxa would be conducted starting the second fall after treatment and continue for a full calendar year, with a minimum of three seasonal sampling events. If the community or pre-treatment taxa have not been re-established following these periods, then additional monitoring would be conducted designed to specifically monitor areas or taxa that have not been re-established. Sampling would continue in this manner until re-establishment is observed or for up to three additional years, whichever is less.

The studies of Whelan (2002) and Mangum and Madrigal (1999) indicate that some individual taxa may be lost and may not be observed within the project area within two years. Based on this, the effects of the project on individual taxa would be significant and unavoidable. Several mitigation measures are recommended to reduce the potential effects to individual taxa; however, some measures, such as not treating some areas, may compromise the purpose of the project, while the feasibility of other measures is untested. Because of these limitations, the impacts of the treatment are considered to be significant and unavoidable even after mitigation from the perspective of retention of all individual taxa.

Impact AR-9: The impacts of the Proposed Project on desirable fish species would be significant but mitigable, as the application of rotenone is anticipated to kill all trout and many other fish species in tributary streams.

Mitigation AR-9: Implement the Fisheries Management Plan (Appendix G).

Significance After Mitigation: Less than significant.

Impact AR-10: The impacts of the Proposed Project on special status invertebrate species would be significant but mitigable. The amphibious caddisfly, *D. bethula*, is known to occur in Big Grizzly, Old House, and Cow creeks and would be affected by the treatment.

Mitigation AR-10a: The California Department of Fish and Game would continue their systematic sampling program to identify waters with special status invertebrate species prior to treatment through the winter of 2006.

Mitigation AR-10b: To minimize the effects of treatment on *D. bethula,* and other special status species that may be present, the California Department of Fish and Game would

sample streams for pike, upstream of any fish passage barriers, before treatment. Sampling would be conducted periodically in 2006 and 2007 before treatment would occur, if this action is approved. Sampling would be done carefully to provide a high assurance that fish of any species are not present. If there is a high degree of certainty that fish are not present, the California Department of Fish and Game would not treat these waters.

Mitigation AR-10c: In isolated waters where fish are not present and special status macroinvertebrate species are known or suspected to be present, the California Department of Fish and Game would install exclusionary fencing or other devices to prevent fish from entering these habitats subsequent to sampling, unless in the California Department of Fish and Game's determination, such devices are unlikely to be successful. This measure is intended to maintain these habitats in a fishless state, so that treatment is unnecessary and that they can be used as a source area for recolonization.

Mitigation AR-10d: Waters where special status macroinvertebrate species are known to be present would be evaluated on a case-by-case basis. If they must be treated, the lowest effective concentration of rotenone and shortest exposure possible to affect a 100 percent kill on pike would be used. A low rotenone concentration for a short duration should have less effect on macroinvertebrates than a high concentration and a longer duration (Whelan 2002).

Mitigation AR-10e: In waters where *D. bethula* is found, treat during September/October. During this time, *D. bethula* is in pupal stage buried in the bank and is not as sensitive to streamborn toxins. The life history and timing of the other special status macroinvertebrates that are potentially present are poorly known, and similar specifications cannot be made for these species.

Mitigation AR-10f: In waters where the density of special status species is sufficient to allow 30 or more individuals to be collected, the California Department of Fish and Game would create refugia in tanks or other suitable holding facilities for these special status macroinvertebrates, as feasible. The collected individuals would be held in these refugia for the duration of the treatment and then released back to their natal environment. This mitigation measure is untested and its feasibility under the various circumstances that could be encountered is unknown.

Significance After Mitigation: Less than significant.

Impact AR-11: The impacts from the Proposed Project on macroinvertebrate communities would be considered less than significant. The timeframe for the macroinvertebrate community to re-establish would be less than two years, based on the available information.

Mitigation AR-11: No mitigation is required.

Impact AR-12: The proposed treatment may result in the loss of individual taxa for more than two years, and therefore would be significant and unavoidable. Because of the extent of the treatment area and the patchy geographic and temporal distribution of macroinvertebrates, mitigation of this potential impact is infeasible.

Treatment of Springs and Other Waters

All other waters suspected to support fish within the watershed would be treated with rotenone. The effects of this treatment would be similar to those described for streams.

Impacts to fish are expected to be the same as described for streams. However springs and other waters may support a few individuals, but are not expected to support separate fish populations.

Spring macroinvertebrate communities share many of the same taxa that occupy stream habitat, but contain some different species and also are more likely to contain endemic species (species that are found nowhere else) (Erman 1996). Like stream macroinvertebrate communities, spring communities are more tolerant of rotenone than most fish species. Where source areas for recolonization are nearby, springs and other waters may have re-establishment times similar to those for streams. However, where springs and other waters are more isolated from untreated source areas, then re-establishment times may be slower.

D. bethula has been identified as occurring in two unnamed springs in the project area. No other special status species of invertebrates have been definitively identified in the project area, but several specimens have been identified as belonging to genera containing rare species that are listed as species of concern. Members of the family of springsnails have also been collected. The sampling effort to identify special status macroinvertebrates, as previously described, includes spring habitats. The greater likelihood of endemism and potential for slower re-establishment means that the treatment of springs is of greater concern than the treatment of streams.

Impact AR-13: The Proposed Project would have a less than significant effect on desirable fish species in springs and other waters. While individual fish may be killed, populations in these areas are not self supporting. After treatment, fish would be recruited to these areas as they are currently, from other areas during periods of high flow.

Mitigation AR-13: No mitigation is required.

Impact AR-14: The Proposed Project would have significant but mitigable impacts to the amphibious caddisfly, *D. bethula,* if springs in which it occurs are treated. The amphibious caddisfly is known to occur in two unnamed springs. This impact would also occur on other special status species that could potentially be present, including springsnails.

Mitigation AR-14: Same as for Impact AR-10.

Significance After Mitigation: Less than significant.

Impact AR-15: The impacts of the Proposed Project would be considered less than significant on spring macroinvertebrate communities. The timeframe for the macroinvertebrate community to re-establish would be less than two years, based on the available information.

Mitigation AR-15: No mitigation is required. However, the California Department of Fish and Game would create refugia in aquaria for spring macroinvertebrate communities and relocate them to their natal habitat after toxic effects have cleared, as feasible.

Significance After Mitigation: Less than significant.

Impact AR-16: The proposed treatment may result in the loss of individual taxa for more than two years, and therefore would be significant and unavoidable. Because of the patchy geographic and temporal distribution of macroinvertebrates, mitigation of this potential impact is infeasible.

Increased Flow in Big Grizzly Creek below Lake Davis during Drawdown

During the drawdown period, flows on Big Grizzly Creek below Lake Davis would range up to 145 to 220 cfs and may persist for 3 to 8 months depending on water year type and starting elevation for the drawdown. The specific effects of these increased flows cannot be quantified based upon the existing information, but are described generally below.

Existing flow-habitat relationships are of little value in this evaluation, as they are empirical in nature and cover a range of flows much lower than the flows of interest here (Haines 1982). Generally speaking, fish habitat in streams increases with flow to some level and then either remains constant or begins to decline, depending on the characteristics of the channel; range of flows evaluated; species; and lifestage under consideration. Juvenile and fry habitat is generally maximized at relatively low flows, while adult habitat is maximized at a somewhat higher flow.

The flows that would be present during the dewatering phase are generally similar to or greater than the highest median monthly flows that occurred in Big Grizzly Creek before Lake Davis was built. These flows would likely create conditions that are substantially less suitable for fry, and perhaps juveniles. While these high flows are unlikely to result in redd scour, as they are less than the unimpaired bankfull flow, they may cause emergent fry to be displaced downstream by high velocities. This could result in reduced natural recruitment to this channel. Adults and juveniles are less likely to be physically displaced, as they are better able to seek out velocity refugia.

The higher flows would likely reduce the suitability of habitat for juvenile and adult trout, as a result of increased velocities. These fish may be required to spend more time in refuge habitat and there may be fewer feeding stations available. While trout are well able to tolerate crowding in refugia habitat, they must receive adequate food during the growth season. A reduction in the number of feeding stations, would be expected to affect the health and growth of individuals, and ultimately reduce the population of the stream. However, it is unknown how the number of feeding stations might be affected. This effect would be short-term in nature, and would return to pre-treatment levels shortly following the implementation of the project and restocking of desirable fish populations.

Higher flows persisting for such a long period of time are likely to change the structure of the macroinvertebrate community within the stream favoring that are well adapted to high velocity environments. The flows are unlikely to extirpate any groups, as macroinvertebrate communities are adapted to deal with periods of elevated flow and velocity refugia would be available on stream margins and behind boulders. Therefore the macroinvertebrate community would return to pre-treatment patterns within a few months of resumption of historic operations. The change in the macroinvertebrate community is unlikely to negatively affect trout, as the organisms adapted to higher velocities are the preferred food for trout.

Thus, elevated flows during the drawdown period are expected to cause the reduction or loss of one year-class of fish spawned within the channel and a temporary alteration of macroinvertebrate community structure below the dam. This fishery, while self-supporting, consists of the progeny of hatchery fish. There are no special status species of fish or macroinvertebrates known or expected to be present in the stream. The flows that would be released are unlikely to result in any changes in channel structure or habitat. Re-establishment is expected to be complete within a few months of resumption of normal flow patterns.

Impact AR-17: Impacts from the Proposed Project would be significant but mitigable on desirable fish species. The young-of-year would be substantially reduced or lost. This impact would be substantially less than impacts resulting from dewatering the stream as described for Neutralization Option 1 (described below).

Mitigation AR-17: The California Department of Fish and Game will restock desirable species from all year classes in Big Grizzly Creek below Lake Davis as described in the Fisheries Management Plan, Appendix G, subsequent to treatment and neutralization.

Significance After Mitigation: Less than significant.

Impact AR-18: Impacts from the Proposed Project would be less than significant on special status aquatic invertebrate species, as none are known to exist or potentially exist in Big Grizzly Creek downstream of Lake Davis.

Mitigation AR-18: No mitigation is required.

Impact AR-19: Impacts from the Proposed Project would be considered less than significant to macroinvertebrate communities. No taxa are expected to be lost and re-establishment is expected to occur within a few months.

Mitigation AR-19: No mitigation is required.

Neutralization of Rotenone at Lake Davis Outlet

Following treatment, the Proposed Project calls for allowing the rotenone to degrade through natural processes. These processes depend on several factors such as water temperature, sunlight, and turbidity. A full description of this process is provided in Section 14, Human and Ecological Health Concerns. To prevent release of the rotenone from Lake Davis to Big Grizzly Creek, four different Neutralization Options have been suggested. These are described in Section 2.3.4, Rotenone Neutralization, and Appendix E, Draft Neutralization Options. Some of these options call for treatment of discharge water with potassium permanganate. All discuss reduction of the existing minimum instream flow (10 cfs) by different amounts for some period of time. The potential effects of potassium permanganate are discussed here, while the effects of flow reduction are discussed in the next section.

Potassium permanganate is a strong oxidizer commonly used to neutralize rotenone (DFG 1994). It is also commonly used as a bactericide, fungicide, and algaecide. The toxicity of potassium permanganate to fish ranges from 0.75 to 3.6 mg/L (96-hour LC_{50} values) and is about 1.8 mg/L for rainbow trout. For invertebrates the 96-hour LC_{50} value is 5 mg/L Potassium permanganate will neutralize rotenone in 15 to 30 minutes, depending on water

temperature. During oxidation, potassium permanganate is converted to manganese oxide, which is biologically harmless.

Because potassium permanganate can be toxic, care must be applied when using it to make sure the rotenone is neutralized, while minimizing the amount of excess potassium permanganate in the water. Overdosing with potassium permanganate occurred in 1992 on Silver King Creek (DFG 1994) and also occurred in Big Grizzly Creek following the 1997 treatment. This resulted in unintentional fish kills on both systems.

Option 1 calls for eliminating all outflow except dam seepage and returning this seepage to the reservoir by means of pumps and pipes or a tanker truck for 14 to 45 days. Under this Option, there would be no risk of rotenone or potassium permanganate entering Big Grizzly Creek. Thus there would be no impact from their release. This would eliminate all flow from a 150-yard-long section of stream immediately below the dam. Flow below this point would be provided by about 60 gallons per minute (0.15 cfs) of spring flow. The impacts of these flow reductions are described in the next section.

Option 2 calls for curtailing flow for 5 days to allow thorough mixing of rotenone in the reservoir. A release of 0.2 to 0.5 cfs would then be neutralized off-stream in “baker tanks” and then this water would be returned to the stream. Flows would be reduced to 0.2 to 0.5 cfs for 14 to 45 days below Grizzly Valley Dam. The spring flow downstream of the dam described above would supplement the flow from the dam. The impacts of these flow reductions are described in the next section.

Option 3 calls for curtailing flow for 5 days to allow thorough mixing of rotenone in the reservoir. After this time, 1 to 2 cfs would be released. This release water would be treated in the natural stream channel with potassium permanganate. Monitoring using sentinel fish would ensure that potassium permanganate concentrations were sufficient to neutralize residual rotenone, yet below toxicity values for fish. The neutralization zone is expected to extend approximately 0.25 to 0.5 mile below the dam. Fish and macroinvertebrates would be adversely affected within this neutralization zone. These resources would be expected to re-establish within a few months after the neutralization treatment ends. The impacts of flow reductions are discussed in the next section.

Option 4 is similar to Option 3, but would have 3 to 5 cfs releases following the five-day flow curtailment (to allow thorough mixing of rotenone in the reservoir). This release water would be treated in the natural stream with potassium permanganate. The same monitoring measures would be used to minimize the potential for overdosing the creek with potassium permanganate. As with Option 3, rotenone and potassium permanganate would enter Big Grizzly Creek below the dam, but would be neutralized within a short distance of the dam (0.25 to 0.5 mile). Fish and macroinvertebrates would be adversely affected within this neutralization zone. These resources would be expected to re-establish within a few months after the neutralization treatment ends. The impacts of flow reductions are discussed in the next section.

Level of Significance

For each of the neutralization options:

Impact AR-20: There would be no impact to desirable fish species from rotenone or potassium permanganate under Options 1 or 2. The impacts under Options 3 and 4 would be less than significant, since the area affected would be relatively small and the fishery would quickly re-establish.

Mitigation AR-20: No mitigation is required.

Impact AR-21: There would be no impact to sensitive invertebrate species from neutralization, as none of these species have been found in Big Grizzly Creek downstream of Lake Davis.

Mitigation AR-21: No mitigation is required.

Impact AR-22: There would be no impact to macroinvertebrate communities from rotenone or potassium permanganate under Options 1 or 2. The impacts from the Proposed Project with Options 3 and 4 would be less than significant as the neutralization zone is short. Areas below this point and tributary springs would serve as sources of recolonization. As a result no taxa are expected to be lost, and re-establishment is expected to occur with a few months.

Mitigation AR-22: No mitigation is required.

Reduced Flow in Big Grizzly Creek Below Lake Davis During Treatment

During the treatment period, flows would be reduced to between 0.1 and 5 cfs, depending on the neutralization option selected. These flow reductions are necessary to neutralize the rotenone in the water discharged from the dam and prevent this chemical from adversely affecting aquatic life downstream of the dam.

In September 2005, the DFG and DWR undertook a study to assess the effects of short-term (4 days) dewatering of Big Grizzly Creek below the dam on fish populations (DWR 2006b). During the study, dissolved oxygen levels dropped to levels stressful or lethal to trout in the two pools on either side of the weir below the dam. The amount of habitat was also substantially reduced (>90 percent) in these pools. Pools further downstream generally retained more than 50 percent of their original size as a result of natural accretion that occurred within 200 feet of the dam. Riffle habitat was reduced even more than pool habitat and did not support fish during the dewatered period. A few fish were stranded and died in dewatered side channels. Fish may have been more susceptible to predation under these crowded conditions. It took about two days for all the water to drain through the four-mile study reach, so impacts to downstream areas were attenuated and less severe than in the upstream areas. The study authors concluded that while the dewatering had some negative effects, they were less severe than those resulting from the rotenone neutralization effort in 1997. The authors noted that this study may not have been of sufficient duration to allow complete drainage of water stored in the stream banks, and that a longer period of dewatering could be required during the actual treatment of the reservoir. If a longer period were needed, the effects of dewatering could be greater than those observed in this study. They found that a small release of water of 1 to 2 cfs with rotenone neutralization could potentially result in fewer effects than either the complete dewatering or the neutralization procedure employed in 1997.

Under Neutralization Option 1, Big Grizzly Creek would receive minimal flows (about 0.05 cfs or less) for a period of 14 to 45 days. These flows would be supplemented by inflow from a small spring located about 300 yards downstream of Grizzly Valley Dam. This flow is about 0.15 cfs. This combined flow of approximately 0.2 cfs would extend at least as far downstream as the Grizzly Ice Pond (approximately four miles), although it may be supplemented for a short time by drainage of water from bank storage. Below the Grizzly Ice Pond, flows may be further supplemented by releases from this reservoir, however it is not known how much water might be available from this source. Therefore, for purposes of this document, the effects in this section of Big Grizzly Creek are assumed to be the same as above the pond, although these effects may be mitigated by releases from the pond, if water is available.

The very low flows above the Grizzly Ice Pond are likely to adversely affect fish and macroinvertebrate communities. While these effects were small in the four-day dewatering study, the proposed period for the treatment would be a minimum of four times this long. The impacts of such a long period of minimal flow would likely be much greater. Flows this low for this period of time would be expected to degrade surface water quality, with higher temperatures and lower dissolved oxygen content. If such conditions occurred, it would severely stress many fish and macroinvertebrate species. This would reduce the health of the individuals and would likely result in increased mortality. Species and lifestages would be more or less affected by these types of changes depending on their resistance, which could result in a change in community composition and age structure. The macroinvertebrate community would shift to those taxa that are tolerant of degraded conditions. Macroinvertebrate communities may take longer to re-establish than those affected in the 0.25-to-0.5-mile-long neutralization zone in Options 3 and 4, as the entire stream would be similarly affected, making sources of recolonization more distant, except for the one known spring about 300 yards downstream of the dam.

The effects of this flow reduction on fish would be lessened through a fish rescue along the entire length of Big Grizzly Creek. Fish in the creek would be captured and relocated to areas unaffected by the dewatering. Streamflows would be ramped down from pre-treatment levels to allow any remaining fish to seek refugia and minimize stranding. Finally, the stream would be restocked with trout following completion of rotenone neutralization.

No feasible mitigation measures have been identified for macroinvertebrate communities.

Under Option 2, flows would be reduced to leakage (0.05 cfs) for a five-day period while rotenone was being allowed to mix in the reservoir. After this period, 0.2 to 0.5 cfs would be released and instream neutralization using the “baker tank” method would begin. The five-day period with minimal flow may result in a minor amount of stranding and potentially increase predation rates for a short period of time as observed during the flow curtailment study (DWR 2006b). This is likely to result in some minor adverse effects on fish and macroinvertebrate communities. This option increases flows after day 5 relative to Option 1. These higher flows will somewhat improve habitat conditions relative to Option 1. However, these flows are still quite low, and would still have substantial impacts to fish and macroinvertebrates, as described for Option 1, although with a slightly lower magnitude. Benefits relative to Option 1, would occur in areas closest to the dam. By the time the water had traveled any substantial distance, the water would likely have warmed to ambient air

temperatures. Dissolved oxygen concentrations would likely be somewhat higher along the entire stream as a result of the greater flow. As with Option 1, macroinvertebrate communities may take longer to re-establish than those in Options 3 and 4, (where there is a 0.25-to-0.5-mile-long neutralization zone), as the entire stream would be similarly affected, making sources of recolonization more distant.

The same measures for fish described for Option 1 would be employed under Option 2 to reduce impacts to fish.

Under Option 3, flows would be reduced to leakage (0.05 cfs) for a five-day period while rotenone was being allowed to mix in the reservoir. After this period, 1 to 2 cfs would be released and instream neutralization would begin. The five-day period with minimal flow may result in a minor amount of stranding and potentially increase predation rates for a short period of time as observed during the flow curtailment study (DWR 2006b). The curtailment of flow would be limited to a short period and is not expected to result in substantial effects on fish or macroinvertebrates. The 1 to 2 cfs flow would provide less adult trout habitat than the normal 10 cfs minimum flow release, based on the instream flow study previously discussed (Haines 1982), but substantially more habitat would be available than under Options 1 or 2. Fry and juvenile habitat would be similar to that available at 10 cfs (Haines 1982). Water quality would be better than under Options 1 or 2. Some warming would still likely occur, but this would be less than under the previous options. Dissolved oxygen levels would be expected to be higher. Macroinvertebrate communities would still shift to taxa that are more tolerant of degraded condition, but flows at this level are expected to preserve more flowing water habitat. Therefore, taxa that utilize this habitat would be better able to persist through the neutralization period. This option is likely to have substantially less impact on fish and invertebrates than either Options 1 or 2 and result in faster re-establishment times for macroinvertebrate communities.

The same measures for fish described for Option 1 would be employed under Option 3 to reduce impacts to fish.

Under Option 4, flows would be reduced to leakage (0.05 cfs) for a five-day period while rotenone mixes in the reservoir. A 3 to 5 cfs flow would then be provided, with in-stream neutralization as described for Option 3. If Option 4 were implemented, it would provide more adult trout habitat than the previously described options and result in less impact to water quality. Juvenile and fry habitat would likely be similar to that under Option 3. More flowing water habitat would be maintained than under any of the previous options, reducing impacts to macroinvertebrate species utilizing these habitats. Option 4 would result in fewer impacts to fish and macroinvertebrates in Big Grizzly Creek, than the previous options. However, balancing the neutralization (completely neutralizing the rotenone without over-dosing with potassium permanganate) would be more difficult at higher flows, thus there would be a higher potential for unintentional mortality of fish and macroinvertebrates in Big Grizzly Creek under this option.

Overall Effect of Rotenone Neutralization

Based on the discussion of impacts above and the discussion in the preceding section of the effects of the chemical neutralization in the preceding section, Option 3 appears to have the

least potential impact on the aquatic ecology of Big Grizzly Creek. While it has a higher potential for a release of rotenone or potassium permanganate than Options 1 or 2, it does not reduce flow and habitat to the same extent as these options. The substantial flow reductions under Options 1 and 2 are expected to result in a large reduction of fish and macroinvertebrate populations over the entire length of the stream. This is compared to a short-term reduction of these populations within the short (0.25 to 0.5 mile) neutralization zone in Option 3.

Option 4 results in more habitat and fewer water quality impacts than the other options. The aquatic community would be adversely impacted to the 30-minute mark (zone of neutralization) due to the effect of rotenone and potassium permanganate. However, the additional flow could result in a greater chance of concentrated pulses of rotenone passing through the neutralization station, thereby requiring higher concentrations of potassium permanganate. The higher concentrations of potassium permanganate could result in increased toxicity downstream of the intended neutralization zone.

Impact AR-23: The impacts from the Proposed Project would be significant but mitigable on desirable fish species.

Mitigation AR-23: Same as for Impact AR-1. Desirable fish species would be stocked following neutralization in accordance with the Fisheries Management Plan, Appendix G.

Significance After Mitigation: Less than significant.

Impact AR-24: The impacts from the Proposed Project would be less than significant on sensitive invertebrate species, because no sensitive aquatic invertebrate species are known to exist or potentially exist in Big Grizzly Creek downstream of Lake Davis.

Mitigation AR-24: No mitigation is required.

Impact AR-25: The impacts from the Proposed Project would be less than significant on macroinvertebrate communities. Options 1 and 2 would affect macroinvertebrate communities in the entire stream, but these communities would be expected to re-establish within two years. The impacts for Options 3 and 4 would be less than significant, as the affected area would be short, and re-establishment is expected to occur within a few months.

Mitigation AR-25: No mitigation is required.

Flow Effects on Middle Fork Feather River

The Proposed Project would increase flows on the Middle Fork Feather River downstream of Big Grizzly Creek during reservoir drawdown and decrease them during the rotenone treatment and neutralization period. As on Big Grizzly Creek, the flow-habitat studies carried out in this river by Haines (1982) are of little use in evaluating changes in habitat at the anticipated flow levels. The range of flows evaluated (9 to 58 cfs) was well below the range of flows contemplated as part of the project and the results cannot be extrapolated to higher flows.

The flow increases due to the project would be substantially lower than the bankfull flow, which is about 1,100 cfs based on 11 years of peak flow record. This record incorporates the

influence of regulation from Lake Davis and Frenchman Lake. Its unimpaired bankfull flow would be substantially larger. Mean monthly flows range from 18 to 600 cfs. Because the range of increased flows contemplated is well within the normal range of annual flow, and much smaller than the bankfull flow, of the Middle Fork Feather River, and because of its larger channel and greater capacity to transport flow, the higher flows resulting from the drawdown are not expected to substantially affect the fish or macroinvertebrate communities of the Middle Fork Feather River.

Flow reductions during neutralization would occur for 14 to 45 days. These flow reductions would not be as severe as those occurring in Big Grizzly Creek below Lake Davis because water is provided by other sources of water in addition to the releases from Lake Davis. These sources include accretion downstream of Grizzly Valley Dam and inflow from upstream areas of the Middle Fork Feather River. Thus the flow reductions may increase stress on the community to a minor degree, but are unlikely to result in significant reductions in overall population size.

Impact AR-26: Impacts from the Proposed Project of higher flows during drawdown and reduced flows during treatment would be less than significant on desirable fish species of the Middle Fork Feather River.

Mitigation AR-26: No mitigation is required.

Impact AR-27: Impacts from the Proposed Project would be less than significant on special status macroinvertebrates because none are known or suspected to occur in Middle Fork Feather River downstream of Big Grizzly Creek.

Mitigation AR-27: No mitigation is required.

Impact AR-28: Impacts from the Proposed Project would be less than significant on macroinvertebrate communities. No taxa are expected to be lost and re-establishment is expected to occur within a few months.

Mitigation AR-28: No mitigation is required.

Dewatering the Reservoir

Impact AR-29: The Proposed Project would not dewater the reservoir and therefore there would be no impact through this mechanism.

Mitigation AR-29: No mitigation is required.

Dewatering the Tributary Streams

Impact AR-30: The Proposed Project would not dewater the tributary streams and therefore there would be no impact through this mechanism.

Mitigation AR-30: No mitigation is required.

Dewatering Springs and Other Waters

Impact AR-31: The Proposed Project would not dewater springs and other waters and therefore there would be no impact through this mechanism.

Mitigation AR-31: No mitigation is required.

Accidental Spill of Harmful Chemicals

Under the Proposed Project, there is some potential that chemicals harmful to aquatic ecosystems could be accidentally released into the environment. The containment protocols and spill prevention and cleanup procedures described minimize the likelihood that such a spill would occur, and maximize the likelihood that if such a spill does occur, it would be small and quickly contained and cleaned up.

The California Department of Fish and Game would implement the Spill Prevention and Containment Plan described in Section 2.3.5 to avoid and minimize the potential impacts related to accidental spills. This plan would provide specific measures to contain and clean up all harmful chemicals that may be used or on site during the project, including rotenone, potassium permanganate, oil, gasoline, and all other chemicals that might be present. It would further specify where appropriate containment and cleanup materials would be located and the appropriate training and deployment of personnel to respond to any accidental spills.

Besides rotenone and potassium permanganate, staging areas would be used to store and stage chemicals that are harmful to aquatic life, including oil, gasoline and other assorted chemicals needed to operate and maintain the boats and vehicles used prior to and during treatment. These chemicals would necessarily be brought near or even in the water during treatment. Should these chemicals spill or otherwise unintentionally enter the aquatic environment they have the potential to cause substantial harm. The project requires that staging areas be set fare enough back from the edge of any waterbody to provide ample time to contain any accidental spill. All staging areas would be equipped with spill containment materials and staffed by trained personnel trained to quickly contain accidental spills. Should a spill occur, the chemicals would be cleaned up according to the Spill Prevention and Containment Plan (see Section 2.3.5). Based on this, the issue of accidental spills presents a less than significant potential to affect aquatic habitats or species.

In order to implement the treatment, access at the land-water interface would be required to the reservoir, the tributary streams, and springs, and to Big Grizzly Creek immediately below Lake Davis and at points downstream. The exact number and location of these access points would be determined based on the project selected and the conditions occurring at the time of treatment. The same chemicals described above would be transported to and across the land-water interface at these locations. While spill containment measures similar to those described above would be in place, there would be a higher potential that these chemicals may accidentally enter the water because the access points are right next to the water. Should rotenone or potassium permanganate spill, the effects would be less than significant relative to the proposed treatment, as they would be confined to the local area. A small gasoline spill would have a less than significant effect, as gasoline is lighter than water and evaporates quickly. If a significant spill of oil should occur, this may have a more prolonged effect depending on the location of the spill and the degree to which it can be contained and cleaned up. Oil may persist for prolonged periods in the environment under some conditions and may have assorted toxic effects. Given the size of the spill that could occur (less than 10 gallons) and that the spill would be immediately contained and cleaned up as specified in the Spill Prevention and Containment Plan, this effect would be less than significant.

Gaining access to conduct the treatment could also result in impacts on the aquatic environment. Access to the reservoir would be via existing boat ramps. These ramps may be extended with landing mats or gravel to allow access to the reservoir at the treatment level. This would result in the loss of a small amount of littoral habitat. Under any alternative, the impacts would be less than significant. There are existing roads along most of the major streams. These roads would be used to set up drip stations or dewatering stations. Paths may need to be created to access streams from the roads, although there are likely many existing paths. Creation of new paths is not expected to cause significant impact to aquatic habitats. Access to areas without roads would be by foot, ATVs, or boats. This is not expected to cause significant impacts to fish or macroinvertebrates in springs or other water bodies. Access to treatment areas is not anticipated to impact fish or invertebrates.

Impact AR-32: The impacts of accidental chemical spills on desired fish species would be less than significant because spill prevention and containment procedures are incorporated into the Proposed Project.

Mitigation AR-32: No mitigation beyond the Spill Prevention and Containment Plan is required.

Impact AR-33: The impacts of accidental chemical spills on special status macroinvertebrate species would be less than significant.

Mitigation AR-33: Same as for Impact AR-32.

Impact AR-34: The impacts of accidental chemical spills on macroinvertebrate communities would be less than significant.

Mitigation AR-34: Same as for Impact AR-32.

7.1.2.5 Alternative A – 15,000 Acre-Feet (Plus Treatment Including Powder)

Alternative A is similar to the Proposed Project with the exception that powdered rotenone would be used within the reservoir. The use of powdered rotenone may increase the likelihood of an accidental spill, as the powdered rotenone would have to be mixed into a slurry on site, prior to being put aboard boats or other vehicles for distribution. The mixing site would be located away from the water within suitable containment facilities. This would therefore present no additional risk to aquatic resources relative to liquid rotenone formulations.

This alternative is expected to have the same impacts to aquatic resources as described for the Proposed Project. The significance of these impacts and the mitigation actions would be the same as described for the Proposed Project.

7.1.2.6 Alternative B – 5,000 Acre-Feet (Plus Treatment)

The difference between Alternative B and the Proposed Project is the level to which the reservoir would be drawn down (5,000 acre-feet vs. 15,000 acre-feet). This alternative would expose about 800 more acres of the reservoir bed than the Proposed Project. This would prolong the time needed to refill the reservoir, although the additional time needed would depend on runoff conditions. All other impacts to aquatic resources are as described for the

Proposed Project, and the impacts, significance and mitigation actions would be the same except for the lowering of the reservoir.

Under this alternative there is a 75 percent likelihood that the reservoir would not be refilled until December of the third year after the treatment was made. This would equate to 19 months longer (two fishing seasons) than the Proposed Project and would exceed the two year criterion to re-establish the fishery.

Lowering Lake Davis

Under this alternative, the littoral habitat would be affected for longer than under Proposed Project. This would extend the time it takes the littoral communities to re-establish beyond the two-year criterion.

Impact AR-35: Impacts from Alternative B on desirable fish species would be significant and unavoidable.

Mitigation AR-35: Restocking the reservoir following the recommendations in the Fisheries Management Plan, Appendix G, would restore the rainbow trout fishery following drawdown and treatment, but there is a 75 percent likelihood that it would take longer than two years for the reservoir to be refilled.

Significance After Mitigation: Significant and unavoidable.

Impact AR-36: There would be no impact from Alternative B on special status invertebrate species, as no such species are known or suspected to occur in Lake Davis.

Mitigation AR-36: No mitigation is required.

Impact AR-37: Impacts from Alternative B would be considered significant and unavoidable to macroinvertebrate communities. The timeframe required for the littoral invertebrate community to re-establish will likely exceed two years, based on known hydrology. Additionally, macroinvertebrate communities are expected to take longer than two years to re-establish. No feasible options are available to effectively reseed invertebrate communities over such a large area.

7.1.2.7 Alternative C – 35,000 Acre-Feet (Plus Treatment)

The difference between Alternative B and the Proposed Project is the level to which the reservoir would be drawn down (35,000 acre-feet vs. 15,000 acre-feet). This would reduce the amount of the littoral area exposed by about 1,100 acres compared to the Proposed Project. The reservoir would not be drawn down below the target level for littoral habitat. The reduced drawdown would shorten the time needed to refill the reservoir by three months relative to the Proposed Project and thus would be less than two years. Except for the level of the drawdown, all other impacts to aquatic resources have the same levels of significance and mitigation as described in the Proposed Project.

Lowering Lake Davis

Impact AR-38: The impact to desirable fish and special status macroinvertebrate species would be similar to those under the Proposed Project and less than significant.

Mitigation AR-38: No mitigation is required.

Impact AR-39: The impact of lowering Lake Davis to 35,000 acre-feet on macroinvertebrate communities would be less than significant. No individual taxa are expected to be lost as a result of drawdown.

Mitigation AR-39: No mitigation is required.

7.1.2.8 Alternative D – 48,000 Acre-Feet (Plus Treatment)

Under Alternative D, the reservoir would not be drawn down. Treatment would occur at an elevation similar to that during the 1997 treatment. Lake Davis would remain at 48,000 acre-feet during treatment, within its normal range of operations. There would be no need to refill the reservoir after treatment, and there would be no loss of littoral habitat. This would also eliminate the need to increase flows in Big Grizzly Creek downstream of the reservoir. With the exception of the change in drawdown level and the lack of higher flow releases, all other impacts to aquatic resources are as described for the Proposed Project, and the impacts, level of significance and mitigation are the same as for the Proposed Project.

Lowering Lake Davis

Impact AR-40: Alternative D would have no impact to desired fish, special status macroinvertebrate species, macroinvertebrate communities, or loss of individual macroinvertebrate species through drawdown.

Mitigation AR-40: No mitigation is required.

Increased flow in Big Grizzly Creek below Lake Davis during drawdown

Impact AR-41: Alternative D would not require higher flow releases into Big Grizzly Creek below Lake Davis. As a result, it would have no impact to desired fish, special status macroinvertebrate species, macroinvertebrate communities, or loss of individual macroinvertebrate species through drawdown.

Mitigation AR-41: No mitigation is required.

7.1.2.9 Alternative E – Dewater Reservoir and Tributaries (No Chemical Treatment)

Alternative E would attempt to eradicate pike without the use of rotenone, by completely dewatering the entire watershed. This alternative calls for completely draining the reservoir and manually draining all remaining standing pools of water within the reservoir footprint. All perennial tributaries would be drained in sections of several hundred to 1,000 feet starting at the headwaters and working downstream. All springs, seeps, and other areas capable of supporting fish would also be drained. Areas with rocky substrate, and interstitial spaces between the rocks, would need to be dewatered for at least two weeks to ensure that pike do not survive in residual pools under rocks in tributary streams or springs. Even then there may be sufficient seepage among the rocks to support a fish for a longer period.

Increased Flow in Big Grizzly Creek Below Lake Davis during Drawdown

Flow increases to Big Grizzly Creek would be as described for the Proposed Project, but would be sustained for a longer duration, because more water would be released. This is not anticipated to substantially increase the impacts over the Proposed Project. Water quality in the creek may be seriously degraded toward the end of the drawdown. As the reservoir is drawn down, algae would be concentrated into a smaller and smaller area and begin to die and decompose. Sediment would also be picked up by water flowing over exposed reservoir bed surfaces, increasing turbidity within the remaining volume of the reservoir. Together these factors would create anoxic conditions as the reservoir gets downs to very low levels. Release of this water into Big Grizzly Creek would result in the death of fish and macroinvertebrates in Big Grizzly Creek for a distance corresponding to the length of stream required to re-oxygenate the water mechanically. This re-oxygenation process would be hampered because the release water would still contain large quantities of decaying vegetation. This decay process consumes oxygen. The nutrients from the decay process would result in a boom of algal production in Big Grizzly Creek. This would result in higher oxygen concentrations during the day, but would contribute to very low dissolved oxygen concentrations at night. The high oxygen demand resulting from decay and algal blooms would likely extend much further downstream than the area where mechanical mixing would reoxygenate the water. The actual extent of the area subjected to low dissolved oxygen concentrations cannot be determined with the available information, but it is anticipated to extend for more than a mile. This would likely affect fish and macroinvertebrate populations and would temporarily affect the fish and macroinvertebrate communities.

Because the fishery within Big Grizzly Creek consists of the progeny of hatchery or non-native stocks, and there are no special status species of fish or macroinvertebrates present in the stream, the impacts of this alternative are less than significant on these species.

Impact AR-42: The impact of Alternative E on desired fish, special status macroinvertebrate species, and macroinvertebrate communities in Big Grizzly Creek below Lake Davis would be less than significant.

Mitigation AR-42: No mitigation is required.

Reduced Flow in Big Grizzly Creek Below Lake Davis

Lower flow to Big Grizzly Creek could occur once the reservoir is drained. Summer and fall inflows to Big Grizzly Creek are less than the minimum instream flow of 10 cfs, with the difference made up out of storage. After the reservoir has been completely drained, there would be no outflow from the dam until the reservoir had refilled its dead pool (107 acre-feet, the volume of water needed to overtop the low point of the outlet gate). With total inflow to the reservoir sometimes being quite low (<1 cfs), this could take more than 50 days. Once the dead pool is refilled, flow levels would be limited to inflow to the reservoir until inflow exceeded 10 cfs or some water could be stored. As previously described, these flows may be nutrient-laden, high turbidity water that has low oxygen content. Poor water quality conditions may result in impacts to downstream fish and macroinvertebrates. Lower flows could also be present in the summers following the draining of the reservoir, as there may not be sufficient water stored in the reservoir to support the current 10 cfs minimum instream

flow release through the low flow period. Thus the flow reductions under this alternative would be at least as severe in magnitude and of much longer duration as those likely to occur under any of the neutralization options that would occur with a rotenone treatment.

Impact AR-43: The impacts from Alternative E would be significant and mitigable to desirable fish species because flows in Big Grizzly Creek would be substantially affected for weeks to months or longer during refill. The reservoir would not be expected to refill in less than two years. However, normal minimum instream flow releases would be expected to be made within this timeframe, so restocking of Big Grizzly Creek could occur.

Mitigation AR-43: Implement the Fisheries Management Plan, Appendix G.

Significance After Mitigation: Less than significant.

Impact AR-44: The impacts from Alternative E would be less than significant on special status aquatic invertebrate species, as none are known to occur in Big Grizzly Creek downstream of Lake Davis.

Mitigation AR-44: No mitigation is required.

Impact AR-45: The impacts from Alternative E would be less than significant to macroinvertebrate communities. Normal flow patterns would resume within two years, which would allow the macroinvertebrate community to re-establish itself. Reduced flows and poor water quality would affect macroinvertebrate communities in the entire stream during the period the reservoir is at minimum pool and before it refills. The reservoir is not expected to refill in less than two years.

Mitigation AR-45: No mitigation is required.

Impact AR-46: The impacts from Alternative E would be significant and unavoidable as it may result in the loss of macroinvertebrate species for more than two years- because flows in Big Grizzly Creek would be substantially affected for weeks to months or longer during refill. Reduced flows and poor water quality would affect macroinvertebrate communities in the entire stream during the period the reservoir is at minimum pool and before it refills.

Flow Effects on the Middle Fork Feather River

Alternative E would result in increased flow in the Middle Fork Feather River as the reservoir is dewatered, and decreased flows once the reservoir has been dewatered until sufficient water is stored to re-establish minimum instream flows. Flow increases to Big Grizzly Creek would be as described for the Proposed Project, but would last longer, because more water would be released. The larger channel of the Middle Fork Feather River should be able to accommodate these higher flows without substantial alterations of channel structure, and pockets of slower water velocity and shallower depths would continue to be available. After the reservoir is drained, flows would be decreased as described above. The decrease would be more dramatic and would last for months longer than what would occur under any of the neutralization options. The impact of decreased flows from Lake Davis would be less in the MF Feather River than in Big Grizzly Creek because of inflows from other sources. Fish would redistribute to accommodate changed distributions of velocity and

depth. Some shift in macroinvertebrate community structure is expected, but these flow changes are not expected to result in the loss of any taxa and the community should recover within a few months of the resumption of normal flow patterns.

Impact AR-47: Impacts from Alternative E would be less than significant on desired fish species, special status macroinvertebrate species and macroinvertebrate communities in the Middle Fork Feather River. No macroinvertebrate taxa would be expected to be lost.

Mitigation AR-47: No mitigation is required.

Dewatering the Reservoir

Dewatering of Lake Davis is intended to eliminate all fish, without introducing rotenone or other chemicals into the watershed. This would expose all littoral habitats within the reservoir and eliminate zooplankton. The overall effects of this would depend on the duration of the dewatering and how long different areas within the reservoir were exposed. It would also depend on what mechanisms the flora and fauna have to deal with dessication. There would be few remaining source areas for recolonization, as the entire reservoir bed would be exposed and the tributary streams would be dewatered simultaneously. The impacts of dewatering the reservoir on fish would be greater than those of the rotenone treatment, as all fish would be killed. The impacts to macroinvertebrate communities would likely be greater than those expected as a result of the rotenone treatment, as it would result in the loss of more taxa and a greater loss of overall abundance.

There is a 75 percent likelihood that the reservoir would be refilled to 45,000 acre-feet by March of the fourth year after dewatering was complete (41 months), substantially longer than the other alternatives. This alternative is anticipated to have a greater impact on macroinvertebrate fauna than the alternatives proposing the use of rotenone. While macroinvertebrate communities are expected to be affected by the rotenone treatment, these communities are generally expected to re-establish within a short time. Dewatering the entire reservoir and all waters within the basin would result in severe reductions of nearly all taxa and the elimination of many. Because of the extent of this dewatering, the entire littoral zone would be dewatered for long periods of time, longer than the emergence timing of many macroinvertebrates. This would reduce the potential for recolonization from non-aquatic adult lifestages and delay the time to re-establish for these populations.

However, problems would be encountered with the outlet works of the reservoir. Debris within the reservoir (principally floating aquatic vegetation) would be concentrated near the outlet pipe as the reservoir reaches low levels. This would tend to plug the trash racks or the outlet pipe, and would prevent the fish strainers (intended to prevent pike from exiting the reservoir through the outlet works) from being used. The water would need to be evacuated from the reservoir through some other mechanism at this stage. Pike would also be concentrated in this remaining pool of water. Use of alternative mechanisms (i.e., the fish grater or “sushi bars”) to drain the remaining water could significantly increase the likelihood that pike would be released to Big Grizzly Creek. This raises a question about the feasibility of this alternative to eradicate pike.

Impact AR-48: The impact of dewatering Lake Davis under Alternative E would have significant and unavoidable impacts to desirable fish populations as the reservoir is anticipated to take up the four years to refill. Thus re-establishment of desirable fish populations would take longer than the two year criterion.

Impact AR-49: Alternative E would have a no impact on special status macroinvertebrate species through dewatering of the reservoir, as no special status invertebrate species are known or suspected to occur in Lake Davis.

Mitigation AR-49: No mitigation is required.

Impact AR-50: The impact of dewatering Lake Davis under Alternative E would have significant and unavoidable impacts to macroinvertebrate communities. The reservoir is anticipated to take up the four years to refill. Thus re-establishment of these communities would take longer than the two year criterion.

Impact AR-51: The impact of dewatering Lake Davis under Alternative E would be significant and unavoidable, as it would likely result in the loss of individual taxa for more than two years.

Dewatering the Tributary Streams

Each of the principal tributary streams is four to six miles long. The stated working period would be between July 1 and September 30, when flows are low enough to allow streams to be completely diverted. Each stream has 20 to 30 sections of a described length that would need to be dewatered during treatment. Thus, the dewatered stream sections would only remain dewatered for a relatively short period of time (i.e. one to a few days). Because there may be leaks in the temporary dam system or small, low-lying areas in the stream may remain slightly wet, there is a chance that some fish could survive for these short periods of time. Fish could also retreat into the hyporheic zone (the area underneath, but in hydraulic connection with the stream). Any surface or subsurface residual water may serve as refugia during dewatering. Because pike can withstand high temperatures and low dissolved oxygen concentrations, a more prolonged period of dewatering would have a much higher likelihood of successfully removing pike. However, if stream sections were to remain dewatered for longer periods, there could be too many sections to dewater within the window of time provided for that process. With longer dewatering periods, this strategy would require multiple years to complete. However, because the higher flows the subsequent winter would allow fish to move back into previously treated areas, this strategy could not be carried over from one year to the next. These issues present a significant question as to the feasibility of this alternative to eradicate pike.

Elimination of flow in tributaries as described for Alternative E could adversely affect macroinvertebrate communities. However, many of these streams, including the major tributaries, have naturally gone dry upon occasion, although the extent and duration of this dewatering are unknown. Therefore a short period of dewatering, up to a month, would have a less than significant impact relative to what occurs naturally.

As with the reservoir, this alternative would have a greater impact on macroinvertebrate fauna than the alternatives proposing the use of rotenone. It would result in a larger loss of

overall numbers and a greater reduction in the number of taxa present as well. The duration of time any section of stream would be dewatered is relatively short, and adjacent stretches of stream downstream of the section being treated would provide sources of re-colonization. Previously dewatered areas within the stream would not be expected to provide sources of immediate re-colonization, as these areas would be occupied at low densities of early life stages. Because of these factors, re-colonization would be expected to take longer in the downstream sections of the stream. However, some re-colonization would be provided by invertebrate drift and by egg-laying adults.

Impact AR-52: The impact of dewatering the tributary streams would be significant but mitigable to desirable fish species, as dewatering the tributaries is anticipated to kill all fish. Desirable fish species would be restocked based on the Fisheries Management Plan.

Mitigation AR-52: Implement the Fisheries Management Plan (Appendix G).

Significance After Mitigation: Less than significant.

Impact AR-53: The impact of dewatering the tributary streams would be significant but mitigable to special status macroinvertebrate species. The amphibious caddisfly is known to occur in Big Grizzly, Old House and Cow creeks. Individuals may be affected by access to and from the stream channels to install pipes and pumps and by drying stream reaches. Other special status macroinvertebrate species may also occur in these streams.

Mitigation AR-53: Measures would be the same as described for Impact AR-10.

Significance After Mitigation: Less than significant.

Impact AR-54: The impact of dewatering the tributary streams would be less than significant to macroinvertebrate communities. The timeframe for the macroinvertebrate community to become re-established is expected to be less than two years, based on the available information.

Mitigation AR-54: No mitigation is required.

Impact AR-55: Impacts from Alternative E would be significant and unavoidable, as dewatering streams may result in the loss of individual taxa for more than two years. Because of the extent of the treatment area and the patchy geographic and temporal distribution of macroinvertebrates, mitigation of this potential impact is infeasible.

Dewatering Springs and Other Waters

Springs and other waters would be dewatered using pumps and hoses to evacuate any water that could support pike from the spring area. Effects on macroinvertebrates would be of short duration but drastic. If spring communities are severely damaged by pumping, the potential isolation of the springs from other populations may prolong time to re-establishment and some species, such as springsnails, might be extirpated. Springs may also contain special status species of invertebrates not found in other locations in the project area and there would be no local source for recolonization.

Impact AR-56: The impacts of dewatering the springs and other waters would be less than significant to desirable fish populations, as the springs and other waters do not support self-sustaining populations.

Mitigation AR-56: No mitigation is required.

Impact AR-57: The impacts of dewatering the springs and other waters would be significant but mitigable to special status macroinvertebrate species. The amphibious caddisfly is known to occur in two unnamed springs. Individuals may be affected by access to and from the springs to install pipes and pumps and by pumping out the springs and other waters. Other special status species may also occur.

Mitigation AR-57: Mitigation would be the same as described in Impact AR-10.

Significance After Mitigation: Less than significant.

Impact AR-58: Impacts from Alternative E would be less than significant to macroinvertebrate communities. The timeframe for the macroinvertebrate community to re-establish would be less than two years.

Mitigation AR-58: The California Department of Fish and Game would create refugia in aquaria for macroinvertebrate communities and relocate to their natal habitat after toxic effects have cleared.

Significance After Mitigation: Less than significant.

Impact AR-59: Impacts from Alternative E would be significant and unavoidable, as dewatering springs and other waters may result in the loss of individual taxa for more than two years. Because of the patchy geographic and temporal distribution of macroinvertebrates, mitigation of this potential impact is infeasible.

Accidental Spill of Harmful Chemicals

There would be a potential for the spill of gasoline and oil into the springs, tributaries, and Lake Davis from equipment used to haul pipes, diversion structures, and other materials, and the pumps used to pump out stream channel sections, springs, or stranded areas in the reservoir. Spill response materials would be kept on site and all personnel trained in their use and deployment.

Impact AR-60: The impacts of accidental chemical spills Alternative E would be less than significant to desirable fish species, special status species of macroinvertebrates, and macroinvertebrate communities, nor would it result in the loss of individual taxa.

Mitigation AR-60: No mitigation is required.

7.1.2.10 Cumulative Impacts

This section addresses the cumulative impact of the project with past, present and reasonably foreseeable actions. A list of projects and a brief description of these projects is provided in Section 1.8.

The area for evaluation of cumulative impacts for the treatment alternatives is described on two scales. The first scale relates to the effect of the proposed treatment alternatives. The

impacts of the treatment alternatives are limited to the Lake Davis watershed, Big Grizzly Creek downstream of Lake Davis, and the Middle Fork Feather River downstream of Big Grizzly Creek.

The second scale encompasses areas where pike are likely to become established if they were to escape from Lake Davis. Cumulative effects at this scale are limited to alternatives that are not anticipated to be successful in eradicating pike from Lake Davis, making their eventual establishment in other waters likely, as described in Section 1.1.3. This area includes the Middle Fork Feather River, Lake Oroville, the Feather River, the Sacramento-San Joaquin Delta, and many waters tributary to the Delta. The effects of pike escape would be cumulative with the effects of other projects affecting aquatic resources in these areas.

Proposed Project

The Proposed Project alternative would not have cumulative impacts with the following projects, because these projects occur outside of the project area or its surrounding environment, and the project would not result in impacts to these other areas.

Paiute Cutthroat Trout Recovery Project. This project is in Silver King Creek in Alpine County. This location is about 100 miles from the Lake Davis Project area and drains to the east side of the Sierra Nevada Mountains. Thus the two projects share no hydrologic connection.

Delta Water Projects (Central Valley Project, State Water Project, South Delta Improvement Project, Operations Criteria and Plan, Lake Oroville Settlement Agreement). These projects are located in the Sacramento-San Joaquin Delta. The effects of the Proposed Project would not extend to the Delta. Rotenone application would be limited to Lake Davis and its tributary streams and springs and other waters. Depending on the neutralization option selected, rotenone and potassium permanganate would either not enter Big Grizzly Creek (Options 1 and 2) or rotenone would be neutralized within one-half mile below Grizzly Valley Dam and potassium permanganate would dissipate to non-toxic levels within this same area (Options 3 and 4). Any changes in flow regime would be eliminated by the operation of Lake Oroville.

The Proposed Project would not have cumulative effects with the following projects because these projects are not anticipated to have any direct or indirect effects on aquatic resources or are expected to be beneficial to these resources.

- DWR Containment Project
- City of Portola Well-drilling
- City of Portola Treatment Plant
- Deek Roadside Hazard Salvage
- Smitty Roadside Hazard Salvage
- Knuston-Vanderberg Cultural Projects
- Public Fuelwood Permits

- Westside Lake Davis Watershed Restoration Project
- Watershed Restoration Projects
- Little Summit Lake Post and Pole Permits
- Recreation Facilities Maintenance and Improvements
- Public Fuelwood Permits
- Humbug DFPZ
- Long Valley KV
- Hazard Tree Removal
- DFPZ Maintenance
- FS Road 24N10 Chip Seal Project
- Cutoff Project
- Mt. Ingalls Project

The Proposed Project may have cumulative impacts when combined with the projects listed below. These impacts are summarized for each project.

1997 Pike Eradication by the DFG

This 1997 project sought to eradicate pike from Lake Davis. While pike were rediscovered, it did succeed in eliminating several other non-desirable fish species (Lahontan redsides, Sacramento sucker, speckled dace, fathead minnow, bluegill, and black bullhead). Trout species would also be eliminated. These trout are either introduced or supported by hatchery planting. Trout would be restocked following treatment and would be considered recovered once the Fisheries Management Plan was implemented. Non-desirable fish species that currently inhabit the project area may or may not survive the treatment. These impacts are beneficial from a biological perspective. Because of this, the incremental impact of the Proposed Project with the 1997 pike eradication project would not be cumulatively considerable.

Grizzly Ranch Development Project

The Grizzly Ranch Development Project is a resort community currently in development. Urban development can adversely affect aquatic habitat by channelizing streams or otherwise altering habitat, altering runoff patterns and inputting pollution. The EIR and SEIR for the Grizzly Ranch Development Project identified no impacts to the aquatic resources of Big Grizzly Creek below Lake Davis. Water supply wells are not hydraulically connected with Big Grizzly Creek. Water treatment and runoff control measures were judged to be sufficient to reduce impacts to aquatic resources to less than significant levels. In its comment letter on the EIR, the DFG indicated that the impacts of the project on the natural resources of the project had been adequately addressed. Based on this, the Grizzly Ranch Development

Project is not expected to exacerbate the impacts of the Proposed Project on the aquatic resources of Big Grizzly Creek.

Grazing Allotments

Grazing has the potential to adversely affect aquatic resources by increasing sedimentation, compacting soils, trampling and consuming riparian vegetation, and polluting the water. These impacts could result in changes in fish and macroinvertebrate habitat and community structure, favoring species that are more tolerant to disturbed conditions. However, current grazing allotments and mitigation measures are expected to result in an improvement of stream and riparian conditions relative to existing conditions in the long term. In the short term, the Proposed Project may be additive to these effects to macroinvertebrate communities, in that they may temporarily increase the proportion of tolerant species. These tolerant species generally have lower oxygen requirements, and therefore are less likely to be affected by rotenone. The macroinvertebrate community in these areas, however, is expected to re-establish to its current state within a few months, as previously discussed. Therefore, the incremental impact of the Proposed Project with the grazing allotments would not be cumulatively considerable.

In summary, the incremental impacts of the Proposed Project with the projects above are not cumulatively considerable.

Alternative A

The cumulative impacts of Alternative A would be the same as for the Proposed Project.

Alternative B

The cumulative impacts of Alternative B would be the same as for the Proposed Project.

Alternative C

The cumulative impacts of Alternative C would be the same as for the Proposed Project.

Alternative D

The cumulative impacts of Alternative D would be the same as for the Proposed Project.

Alternative E

The cumulative impacts of Alternative E would be the same as for the Proposed Project, assuming the alternative is feasible. However, if Alternative E is not feasible, the impacts would be similar to the No Project alternative.

7.1.2.11 Environmental Impacts Summary

The impacts of the different alternatives based on evaluation of the aquatic resource issues above are summarized in Table 7.1-7. All alternatives have significant and unavoidable

impacts associated with them. The Proposed Project and Alternatives A through D are expected to have generally similar effects on aquatic resources. Each of these alternatives would result in the death of all of the pike and trout (other species may or may not survive) in Lake Davis and other treated tributary streams and water bodies. It appears from the analysis of Alternative E that this alternative would likely be infeasible, because of the length of time dewatering would be needed to ensure pike were killed and the length of stream involved. In addition, even if feasible, it would have greater impacts to aquatic resources than the other alternatives, although the other alternatives would have potentially substantial adverse impacts.

The No Project alternative and Alternative E (if infeasible to implement) would not eradicate pike. Pike populations would continue to grow under these alternatives. This would lead to a reduction in the abundance and diversity of fish, amphibians, and macroinvertebrates within the Lake Davis watershed over time, as pike became more dominant within the system. More significantly, pike would eventually escape from Lake Davis as described in Section 1.1.3. Thus, these alternatives present a much larger potential impact than the other alternatives.

Should pike become established in waters downstream of Lake Oroville, they would affect a number of species whose numbers have already declined significantly, as well as many other species which are vulnerable to predation by pike (Maniscalco and Morrison 2006, Appendix A). Most significantly these include Chinook salmon, steelhead, delta smelt, and splittail. The populations of all of these species, except fall-run Chinook salmon, are currently in peril, even without the presence of pike in the Delta (Moyle 2002).

The effect of reductions in salmon populations on commercial and recreational fisheries has been demonstrated by recent restrictions placed on these fisheries based on anticipated low returns of salmonids in the Klamath River. Eggs, fry and juvenile delta smelt and splittail share the same habitat that would be used by pike fry and juveniles. Pike fry and juveniles would prey upon these lifestages, when they are particularly vulnerable. The adult delta smelt are also likely to be a food item for pike. Operations at the SWP and CVP pumps are constrained by delta smelt populations. If pike reduce the number of delta smelt, this could result in a reduction of pumping rates during some seasons, which would reduce the amount of water available for water supply purposes. This in turn could limit agricultural, municipal, and industrial uses of water. See Section 12.2.3.6 for a discussion of economic losses associated with a reduction in exports from the SWP/CVP systems south of the Delta.

Alternatives A through E also have significant and unavoidable impacts associated with their effects on macroinvertebrates. These relate to their impacts on littoral communities within the reservoir, and the loss of individual taxa. Following the 1997 treatment, the littoral community had a lower abundance two years after treatment than it did two years prior to treatment. Because this occurred at that time, it is likely that it could occur again. The loss of individual taxa relates primarily to the difficulty of sampling rare taxa, as described in Section 7.1.2.4, Treatment of Tributary Streams. While the possibility that one or more taxa could be lost as a result of treatment cannot be ruled out, it would be difficult to say with any degree of certainty that the missing taxa were eliminated by the treatment. Macroinvertebrate populations are patchily distributed in space and time. Many taxa are relatively rare at all times. Thus when a rare species is absent after treatment, it may not be clear whether this species was actually absent or missed during sampling. Two considerations reduce the level

of concern regarding this potential. Firstly, the project area has been previously treated with rotenone, and the species currently occupying the project area either were not extirpated by that treatment, or have since recolonized the project area. Secondly, there are no known species that are restricted to only the Lake Davis watershed. All species known to be present are also found in other areas of the state. This does not mean, however, that the Lake Davis area may not support sub-populations that are distinct from those observed in other areas.

Alternative E is expected to have a substantially longer term impact on aquatic resources than the other alternatives. It would affect all aquatic macroinvertebrates in all waters, as few species can tolerate desiccation for prolonged periods, whereas rotenone would not affect all species. Because of this larger impact, it is anticipated that it would take macroinvertebrate communities longer to re-establish following Alternative E. The reservoir would also take substantially longer to refill after dewatering, which would increase the time it takes the reservoir community to recover. This alternative could also result in Big Grizzly Creek below Lake Davis being dewatered for a longer period of time, with consequently greater impacts.

With the exception of the impacts to littoral macroinvertebrate communities and the loss of individual taxa, described above, the Proposed Project and Alternatives A through D would result in primarily short-term impacts to the resources within the project area.

This determination is based on the following points;

- No known special status fish species occur in the project area;
- One special status macroinvertebrate species, the amphibious caddisfly, has been found within several creeks and two springs in the project area. Mitigation has been proposed to protect this species;
- Lake Davis is an artificial ecosystem;
- The principal fisheries have historically been managed as put and take fisheries;
- Treatment would result in elimination of the sport fishery for at least 60 days and up to three to four years depending on the alternative selected;
- The sport fishery in Big Grizzly Creek downstream of Lake Davis would be impaired for several months during drawdown and treatment; and
- The affected ecosystems are expected to re-establish themselves within a short period of time.

The principal difference among these alternatives is the time it would take the ecosystem to re-establish itself. For the Proposed Project and Alternatives B through D, the only difference is the level to which the reservoir is drawn down. This would affect the time it takes to reach the treatment level and the time it would take to refill the reservoir after treatment. The lower the reservoir level, the longer each of these elements would take. The time to refill is also strongly dependent on the amount of precipitation in the year or years following treatment. Alternative E, which calls for completely dewatering the reservoir, streams, and accessible springs and other waters in the watershed would not have the impacts of rotenone treatment, but would likely have at least similar and likely, more severe impacts on the fish and macroinvertebrates within the watershed.

Table 7.1-7. Summary Comparison of Impacts of Alternatives, Aquatic Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Action	A	B	C	D	E
Aquatic Resources							
1. Lowering Lake Davis							
Desirable Fish	N	LS, A	LS, A	SU, A	LS, A	N	na
Zooplankton Community	N	LS, A	LS, A	LS, A	LS, A	N	na
Littoral Community	N	SU, A	SU, A	SU, A	LS, A	N	na
Loss of Individual Taxa	N	SU, A	SU, A	SU, A	LS, A	N	na
2. Treatment of Lake Davis							
Desirable Fish	N	SM, A	SM, A	SM, A	SM, A	SM, A	na
Zooplankton Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	na
Littoral Community	N	SU, A	SU, A	SU, A	SU, A	SU, A	na
Loss of Individual Taxa	N	SU, A	SU, A	SU, A	SU, A	SU, A	na
3. Treatment of Tributary Streams							
Desirable Fish	N	SM, A	SM, A	SM, A	SM, A	SM, A	na
Special Status Macroinvertebrates	N	SM, A	SM, A	SM, A	SM, A	SM, A	na
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	na
Loss of Individual Taxa	N	SU, A	SU, A	SU, A	SU, A	SU, A	na
4. Treatment of Springs and other waters							
Desirable Fish	N	LS, A	LS, A	LS, A	LS, A	LS, A	na
Special Status Macroinvertebrates	N	SM, A	SM, A	SM, A	SM, A	SM, A	na
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	na
Loss of Individual Taxa	N	SU, A	SU, A	SU, A	SU, A	SU, A	na

Table 7.1-7. Summary Comparison of Impacts of Alternatives, Aquatic Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Action	A	B	C	D	E
5. Increased Flow in Big Grizzly Creek below Lake Davis							
Desirable Fish	N	SM, A	SM, A	SM, A	SM, A	N	LS, A
Special Status Macroinvertebrates	N	LS, A	LS, A	LS, A	LS, A	N	LS, A
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	N	LS, A
Loss of Individual Taxa	N	LS, A	LS, A	LS, A	LS, A	N	LS, A
6. Neutralization of Rotenone at Lake Davis Outlet							
Desirable Fish	N	LS, A	LS, A	LS, A	LS, A	LS, A	N
Special Status Macroinvertebrates	N	LS, A	LS, A	LS, A	LS, A	LS, A	N
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	N
Loss of Individual Taxa	N	LS, A	LS, A	LS, A	LS, A	LS, A	N
7. Reduced Flow in Big Grizzly Creek below Lake Davis							
Desirable Fish	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
Special Status Mcroinvertebrates	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Loss of Individual Taxa	N	LS. A	LS. A	LS. A	LS. A	LS. A	SU, A
8. Flow effects on Middle Fork Feather River							
Desirable Fish	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A

Table 7.1-7. Summary Comparison of Impacts of Alternatives, Aquatic Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Action	A	B	C	D	E
Special Status macroinvertebrates	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Loss of Individual Taxa	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
9. Dewatering Lake Davis							
Desirable Fish	N	na	na	na	na	na	SU, A
Special Status Macroinvertebrates	N	na	na	na	na	na	LS, A
Macroinvertebrate Community	N	na	na	na	na	na	SU, A
Loss of Individual Taxa	N	na	na	na	na	na	SU, A
10. Dewatering the Tributaries							
Desirable Fish	N	na	na	na	na	na	SU, A
Special Status Macroinvertebrates	N	na	na	na	na	na	SM, A
Macroinvertebrate Community	N	na	na	na	na	na	LS, A
Loss of Individual Taxa	N	na	na	na	na	na	SU, A
11. Dewatering Springs and Other Waters							
Fish	N	na	na	na	na	na	LS, A
Special Status Macroinvertebrates	N	na	na	na	na	na	SM, A
Macroinvertebrate Community	N	na	na	na	na	na	LS, A
Loss of Individual Taxa	N	na	na	na	na	na	SU, A

Table 7.1-7. Summary Comparison of Impacts of Alternatives, Aquatic Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Action	A	B	C	D	E
12. Accidental Spill of Harmful Chemicals							
Desirable Fish	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Special Status Macroinvertebrates	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Macroinvertebrate Community	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
Loss of Individual Taxa	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A

Key:

A = Adverse Impact (NEPA)
B = Beneficial Impact (NEPA)
LS = Less than Significant Impact (CEQA)
N = No Impact (CEQA, NEPA)
na = Not applicable
SM = Significant but Mitigable Impact (CEQA)
SU = Significant and Unavoidable Impact (CEQA)

7.1.2.12 Monitoring

The DFG proposes several monitoring measures to help evaluate the actual impacts of the project, should it be implemented. These programs have been included as mitigation measures and are described briefly below.

The DFG would continue their systematic sampling program to identify waters with special status invertebrate species prior to treatment through the winter of 2006. This monitoring would use the inventory sampling protocol currently being employed. After the treatment, this sampling protocol would be conducted for one full year starting in fall of the second year after treatment, to assess whether individual species are still present.

In 2007 and 2008, pre- and post-treatment, the DFG would conduct community level macroinvertebrate sampling using the California Stream Bioassessment Protocol. This sampling effort would be used to monitor the impacts of the treatment and the re-establishment of these communities following treatment.

The monitoring programs described above each would be continued for approximately one year after treatment to monitor re-establishment of the macroinvertebrate community and assess impacts. In the event that these communities have not been re-established, these monitoring programs may be extended annually for up to three years. These ongoing monitoring programs may be customized to focus on areas or species where impacts are still being observed.

7.2 Wildlife Resources

7.2.1 Environmental Setting/Affected Environment

This section includes descriptions f or terrestrial wildlife resources, terrestrial wildlife habitat, wildlife, special status species of terrestrial wildlife, migratory birds, and the regulatory environment.

7.2.1.1 Terrestrial Wildlife Resources

This section describes the existing terrestrial wildlife resources that are associated with the project area. Terrestrial wildlife includes all vertebrate species except the fishes, and excludes all aquatic invertebrate species. Amphibians are addressed under terrestrial wildlife even though they have an aquatic larval life history stage. This section provides an overview of typical terrestrial wildlife species and their habitats that are present within the project area as well as information on special status species that may also occur in the area.

7.2.1.2 Terrestrial Wildlife Habitat

The Lake Davis impoundment is within a broad valley that includes wetlands, grassy meadow, big sagebrush, and scattered pine trees. The surrounding forests are characterized as the Sierra Nevada east side pine complex, with Sierran mixed conifer associations occurring primarily on north and east aspects (DFG 1997; Schultz and Nickerson 2004). The hills surrounding the reservoir include dense stands of Jeffrey pine (*Pinus jeffreyi*), ponderosa

pine (*Pinus ponderosa*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), and scattered stands of aspen (*Populus* sp.). Dense stands of lodgepole pine (*Pinus contorta*) surround the wet meadows that extend along the major tributaries of Lake Davis (USFS 1988). The distance between the shoreline of the reservoir and the high water mark varies depending on reservoir level. This area may be sparsely vegetated, mostly with sedges (*Carex* spp.) and annual species of forbs and grasses. There are scattered stands of willow (*Salix* spp.) at the edge of the reservoir at the high water mark, and along the perennial streams draining into the reservoir. Aquatic and emergent vegetation is often a prominent feature of the reservoir, especially in late summer (DFG 1997). Big Grizzly Creek passes through a fairly steep and narrow canyon below the dam where conifers dominate the canyon slopes. These vegetation communities provide habitat for a diversity of wildlife characteristic of the northern Sierra Nevada mountains as well as for numerous special status species.

Riparian or streamside habitats support a greater diversity and abundance of wildlife than most other vegetative cover types. Riparian vegetation such as willow (*Salix* spp.) and alder (*Alnus* spp.) require the wet soils associated with streamside habitats. Willow, alder, and other riparian trees and shrubs often form dense stands that provide hiding and nesting cover, and are an important source of seeds, fruits, and insects which are fed upon by a diverse array of wildlife. Riparian areas serve as corridors for wildlife movement and migration, and act as wildlife refuges during wildfires. Streamside habitats are often the first areas reoccupied by vegetation and wildlife after stand-replacing fire events. Riparian habitats are important to many species of birds, mammals, reptiles, and amphibians.

Livestock have grazed the area around Lake Davis for many decades. Sheep were primarily grazed in the area until 1966 when the reservoir was created and the USFS converted the allotments to cattle use only. Livestock have contributed to the degradation of streamside habitats of drainages entering Lake Davis. Portions of Freeman and Big Grizzly creeks have livestock exclosures to protect stream banks from cattle (Schultz and Nickerson 2004).

Terrestrial habitat elements that are particularly important for wildlife include large trees, snags (standing dead trees), deciduous trees, and large woody debris. Snags, especially large ones, are important habitat for many species of birds and mammals, and are the main source of down woody debris. Past forest management practices, including logging, firewood cutting, road construction, and other activities, appear to have reduced the number of large diameter trees and snags in the forest surrounding Lake Davis.

Maintained roads parallel much of the Lake Davis shoreline where developed campgrounds, commercial concessions, and boat launches provide recreational opportunities. Scattered and concentrated residential developments, including a golf course, occur between the dam and State Highway 70.

7.2.1.3 Wildlife

Wildlife species that occur in the Lake Davis basin are typical of the northern Sierra Nevada east side pine habitats (DFG 1997). The list of wildlife species that potentially occur in the Lake Davis area includes over 170 species of birds, 69 species of mammals, 14 species of reptiles, and eight species of amphibians. Birds that nest in the area include hummingbirds, woodpeckers, flycatchers, jays, chickadees, warblers, sparrows, and finches (DWR 1973).

The entire surface of Lake Davis provides waterfowl habitat (DWR 1973) and fourteen species of waterfowl may use the seasonal and permanent wetlands for nesting in the spring. During fall migration waterfowl often concentrate in the area (USFS 1988). Birds of prey known to use the area include red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great-horned owl (*Bubo virginianus*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), northern goshawk (*Accipiter gentilis*), California spotted owl (*Strix occidentalis occidentalis*), and great gray owl (*Strix nebulosa*).

The most common amphibians and reptiles include Pacific treefrog (*Hyla regilla*), western toad (*Bufo boreas*), long-toed salamander (*Ambystoma macrodactylum*), and common garter snake (*Thamnophis sirtalis*). Typical mammal species include at least seven species of bats, shrews (*Sorex* spp.), moles (*Scapanus* spp.), mice (*Peromyscus* spp.), pocket gophers (*Thomomys* spp.), western gray and Douglas squirrels (*Sciurus griseus, Tamiasciurus douglassii*), American beaver (*Castor canadensis*), mountain beaver (*Aplodontia rufa*), cottontail rabbit (*Sylvilagus nuttallii*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), and mountain lion (*Felis concolor*). Two species of big game wildlife are found within the Lake Davis area: mule deer (*Odocoileus hemionus*) and black bear (*Ursus americanus*). The entire Lake Davis shoreline and surrounding forest constitutes deer summer range and is also used by bears. The Smith Peak State Game Refuge, established in the 1920s for the protection of big game wildlife, includes the forest surrounding the south and west sides of Lake Davis, and west of Big Grizzly Creek from Grizzly Valley Dam downstream to State Highway 70. Hunting and the possession of firearms are prohibited within the refuge.

7.2.1.4 Special Status Species of Terrestrial Wildlife

Special status wildlife are those species that have received special designation under the authorities of state or Federal agencies due to concerns about the species' continuing status in the wild. Site-specific occurrence information for most special status species are included in the California Department of Fish and Game's California Natural Diversity Database (CNDDB), a computerized inventory of location information on rare animals, plants, and natural communities in California. The CNDDB is continually refined and updated, is used extensively by natural resource management agencies, and represents the most comprehensive distribution information available on these species within California. Species protected under the Federal Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq.*) are listed as Threatened or Endangered. Endangered species are species that are in danger of extinction throughout all or a significant portion of their range. Threatened species are species that are likely to become endangered species throughout all or a significant portion of their range. A Proposed species is any species that is proposed in the Federal Register to be listed as a threatened or endangered species under the ESA. A Candidate species has been identified by the USFWS to be proposed for ESA listing at sometime in the near future. A list of species protected under the ESA and potentially occurring on the Plumas National Forest (PNF) was obtained April 7, 2006 (database update of March 1 2006), through the USFWS Sacramento Office web site: http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm (Appendix H.1). No designated critical habitat is found in the Lake Davis project area. This list fulfills the requirements pursuant to Section 7(c) of the ESA for a current project-specific species list.

Sensitive wildlife are those species that have been designated by the USFS as needing special management attention because of known or suspected concerns about species and/or habitat viability. The USFS considers the long-term conservation needs of these species in order to avoid future population declines and the need for listing under the ESA. The list of USFS sensitive species for the PNF, as designated by the Regional Forester for the Pacific Southwest Region of the USFS in compliance with USFS Manual 2670, dated June 8, 1998 and appended March 6, 2001, was accessed via the USFS web page http://www.fs.fed.us/r5/projects/sensitive-species/sensitive-animals.html (Appendix H.2).

The PNF Land and Resource Management Plan (LRMP) (USFS 1988) and the Sierra Nevada Forest Plan Amendment (SNFPA) (USFS 2001), and Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USFS 2004a) provides guidance on management of forest resources through the use of management indicator species (MIS). The MIS are representative of specific habitat types and represent entire wildlife communities, and indirectly provide for monitoring the status of the approximately 313 native species of vertebrate wildlife found on the PNF. Project-level effects are analyzed for selected MIS based on their presence in the project area and potential vulnerability to project-related actions. Impact analysis is not focused on individuals but on populations and population trends within the context of forest-wide habitat conditions. Monitoring of MIS is addressed at the LRMP and programmatic level. The PNF LRMP (USFS 1988) provides a list of nine species of terrestrial wildlife MIS. These are:

- Peregrine falcon;
- Bald eagle;
- Spotted owl;
- Goshawk;
- Golden eagle;
- Prairie falcon;
- Canada goose;
- Deer; and
- American Marten.

Of these, only the Canada goose and deer do not have other special status as designated by a state or Federal agency. Since all state and federal designated special status species are evaluated on a project-specific basis, additional analysis under the guidance for MIS is not necessary (USFS 2004). Both the Canada goose and mule deer occur in the proposed project area, and, therefore, they will be included in the project-specific analysis as MIS.

The State of California also provides special status species designations under the authorities of the DFG. These designations are Fully Protected, State Endangered, State Threatened, and State Species of Special Concern. All documented species occurrence records in the CNDDB (commercial version dated January 04, 2006) recorded on those USGS topographic maps that include the PNF (Appendix H.3) were reviewed for the presence of any State of California

designated special status wildlife species to be included on the Lake Davis project special status species list.

Other special status species are those that have been included in Habitat Conservation Plans prepared under the provision of Section 10(a) of the ESA, or other Conservation Strategies that apply to particular areas or actions as conducted under the authority of a cooperating entity. The CalFed Bay-Delta Program is providing funding to the Lake Davis pike eradication project. CalFed is a collaboration among 25 state and Federal agencies that came together with a mission to improve water supplies in California and the health of the San Francisco Bay/Sacramento-San Joaquin River Delta. CalFed established a 30-year plan that includes a multi-species conservation strategy that addresses the long-term conservation of 71 species of terrestrial wildlife (including invertebrates) (Appendix H.4). The list of all CalFed covered species was compared to documented species occurrences that are recorded in the CNDDB for those USGS topographic maps that include the PNF (Appendix H.3). CalFed covered species that occur in the area of the PNF are included in this project-specific evaluation as special status species.

The list of special status terrestrial wildlife species for the general PNF area, as generated from the above referenced sources, is provided in Table 7.2-1. This table includes a brief synopsis of each species' habitat requirements and the potential for the species or its habitat to occur in the Lake Davis project area. A total of 50 species are included on Table 7.2-1; however, 14 species have been eliminated from further project specific analysis due to a lack of suitable habitat in the project area and no known occurrence records from the general vicinity. These species are:

- Valley elderberry longhorn beetle — Project area above known elevation limits
- Carson wandering skipper — No habitat or observations in the project area
- California red-legged frog — Project area above known elevation limits
- Cascade frog — Outside the species' known geographic range
- Northern leopard frog — Not known to occur on the Ranger District
- Giant garter snake — Outside the species' known geographic range
- Greater sage grouse — Marginal habitat; low potential of occurrence
- Black tern — Outside the species' known geographic range
- Black swift — No breeding habitat; low potential occurrence
- Bank swallow — No nesting habitat
- Tricolored blackbird — Outside the species' known geographic range
- Pygmy rabbit — Outside the species' known geographic range
- Western white-tailed rabbit — Outside the species' known geographic range
- American badger — No records from project area

Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Invertebrates						
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT			MSCS	This species is found in riparian forests and is completely dependent on its host plant, elderberry (*Sambucus* spp.), a common component of California's Central Valley. Elevation: below 3,000 feet (900 meters)	The project area is outside of geographic and elevation range. This species is not expected to occur in the project area and is excluded from further evaluation in this document.
Carson wandering skipper (*Pseudocopaedoes eunus obscurus*)	FE				Found in grasslands on alkaline substrates near springs in eastern California. The larval host is salt grass. Elevation: below 5,000 feet (1,524 meters)	Project area is outside of elevation range. This species is not expected in the project area and is excluded from further evaluation in this document.
Amphibians						
California red-legged frog (*Rana aurora draytonii*)	FT		CSC	MSCS	Breeds in permanent or mostly permanent ponds or streams with deep backwater areas typically but not always with riparian or emergent vegetation in water at least 2.5 feet deep. Elevation: usually below 3,936 feet (1,200 meters)	Project area is outside of species' elevation range. The closest known record is about 15 miles from the project area. This species is excluded from further evaluation in this document.
Cascade frog (*Rana cascadae*)			CSC		Found in water and surrounding vegetation in mountain lakes, small streams, and ponds in meadows up to timberline. Occurs in two locations in the California Cascades, in Siskiyou County, and further south near Lassen Peak. Elevation: 3,000 to 9,000 feet (900 to 2,727 meters).	Geographic range is north of the project area. This species is unlikely to occur in the project area and is excluded from further evaluation in this document.
Mountain yellow-legged frog (*Rana muscosa*)	FC	FSS	CSC		Found in the Sierra Nevada from Plumas County to southern Tulare County. Associated with streams, lakes and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadow habitat types. Elevation: 4,500 to 12,000 feet (1,380 to 3,690 meters).	Suitable habitat exists within the project area. The closest reported population is 10 to 15 miles from the project area. Historical record from Big Grizzly Creek.

[1]Species Identified by Shading Have Been Determined not to be Present in the Project Area and Have Been Excluded from Further Analysis Within this Document.

Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Northern leopard frog (*Rana pipiens*)		FSS	CSC		In northern California, found in Modoc County and possibly eastern Lassen County. Highly aquatic, leopard frogs occur in or near quiet, permanent and semi-permanent water in many habitats. Elevation: 0 to 7,000 feet (0 to 2,130 meters).	Not known to occur in Beckwourth Ranger District or Plumas County. The closest reported population is 15 to 20 miles from the Lake Davis. The project area is outside the geographic range. This species is excluded from further evaluation in this document.
Foothill yellow-legged frog (*Rana boylii*)		FSS	CSC	MSCS	Found in or near rocky streams in a variety of habitats in most of northern California west of the Cascade crest, and along the western flank of the Sierra Nevada south to Kern County. Elevation: 0 to 6,000 feet (0 to 1,830 meters) in the Sierra Nevada.	Recent surveys have not located any individuals within the project area, and potentially suitable habitat is limited. project area may exceed elevation limits. The closest known record is 10 to 15 miles from the project area.
Reptiles						
Northwestern pond turtle (*Clemmys marmorata marmorata*)		FSS	CSC	MSCS	Associated with permanent or nearly permanent water in a wide variety of habitat types west of the Sierra-Cascade crest. Elevation: sea level to 6,000 feet (1,830 meters).	Suitable habitat is present; however, there are no known occurrences in the project area. Project area may exceed elevation limits. The closest known population is 10 to 15 miles away.
Giant garter snake (*Thamnophis gigas*)	FT		CT	MSCS	Primarily associated with marshes and sloughs, less with slow-moving creeks, and absent from larger rivers. This species is considered extirpated south of northern Fresno County. Elevation: 0 to 400 feet (0 to 122 meters).	Outside of geographic range. This species is not expected to occur in the project area and is excluded from further evaluation in this document.
Birds						
Common loon (*Avia immer*)			CSC		Found on large, deep lakes in valleys and foothills throughout California. Recorded rarely on large mountain lakes such as Lake Tahoe.	Suitable habitat is present within the project area. Migratory birds have been observed at Lake Davis.
American white pelican (*Pelecanus erthroohynchos*)			CSC		In California, now nests only at large lakes in Klamath Basin, especially Clear Lake.	Suitable habitat is present within the project area. This species has been observed foraging at Lake Davis.

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Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Canada goose (*Branta canadensis*)		MIS			Preferred habitats include lakes, fresh water emergent wetlands, moist grasslands, croplands, pastures, and meadows. Prefers to nest near water. In winter, prefers to feed in fields near safe roosting areas on open water of lakes and ponds.	Suitable habitat is present. This species is known to occur and nest in the project area.
Swainson's hawk (*Buteo Swainsoni*)		FSS	CT	MSCS	This species breeds in stands with few trees in juniper-sage flats, riparian areas, and in oak savannah in the Central Valley. It forages in adjacent grasslands, grain and alfalfa fields, and livestock pastures.	Suitable habitat is present in the project area. It is reported breeding in Antelope Valley, about 10 to 15 miles southeast of Lake Davis.
Ferruginous hawk (*Buteo regalis*)			CSC		This species frequents open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys, and fringes of pinyon-juniper habitats.	No suitable nesting habitat present within the project area. Potential occurrence as a migrant or during winter.
Osprey (*Pandion haliaetus*)			CSC	MSCS	Associated strictly with large, fish-bearing lakes and rivers. Nests are placed in large trees or snags.	This species is known to occur in the project area and nests in the vicinity.
Bald eagle (*Haliaeetus leucocephalus*)	FT	MIS	CE, FP	MSCS	Nest in large, old-growth trees or snags in remote, mixed stands near water. Feeds primarily on fish and waterfowl.	Known to nest and forage at Lake Davis.
Golden eagle (*Aquila chrysaetos*)		MIS	CSC		Typically occurs in wide arid plateaus deeply cut by streams and canyons, open mountain slopes, and cliffs and rock outcrops in rolling foothills, mountain areas, sage-juniper flats, and desert. Elevation: 0 to 11,500 feet (0 to 3,833 meters).	Suitable habitat is present. This species is known to occur at Lake Davis.
Northern harrier (*Circus cyaneus*)			CSC	MSCS	Found from annual grassland up to lodgepole pine and alpine meadow habitats, as high as 10,000 feet (3,000 meters). It nests on the ground in shrubby vegetation, usually at the edge of a marsh.	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis.

[1]Species Identified by Shading Have Been Determined not to be Present in the Project Area and Have Been Excluded from Further Analysis Within this Document.

Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Sharp-shinned hawk (*Accipiter striatus*)			CSC	MSCS	Prefers, but not restricted to, riparian habitats. North-facing slopes with plucking perches are required. It breeds in mid-elevation habitats, including ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jeffrey pine.	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented foraging at Red Clover Creek, approximately 1.5 miles north of Lake Davis.
Cooper's hawk (*Accipiter cooperii*)			CSC	MSCS	Prefers dense stands of live oak, riparian deciduous, or other forest habitats near water. Nests in trees of second-growth conifer stands or in deciduous riparian areas, usually near streams. Elevation: 0 to 9,000 feet (0 to 2,700 meters)	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented foraging at Red Clover Creek, approximately 1.5 miles north of Lake Davis.
Northern goshawk (*Accipiter gentilis*)		FSS, MIS	CSC		Prefers middle and higher elevations, and mature, dense conifer forests. Casual in winter along coast, throughout foothills, and in northern deserts, where it may be found in pinyon-juniper and low-elevation riparian habitats.	Suitable habitat is present within the project area. This species is known to nest regularly at Lake Davis.
American peregrine falcon (*Falco peregrinus anatum*)	FD	MIS	CE, FP	MSCS	Nests on steep cliffs mostly in woodland, forest, and coastal habitats. Riparian areas and coastal and inland wetlands near cliffs are important habitats yearlong.	Suitable foraging habitat is present within the project area. No observations have been reported within the project area though it is known to nest within five miles of Lake Davis.
Prairie falcon (*Falco mexicanus*)		MIS	CSC		This species occurs in annual grasslands to alpine meadows, but is associated primarily with perennial grasslands, savannas, rangelands, some agricultural fields, and desert scrub areas.	Suitable nesting habitat is not present within the project area. This species has nested near the project area within the last three years and foraging birds have been seen in the Lake Davis area.
Great gray owl (*Strix nebulosa*)		FSS	CE		This species breeds in old-growth red fir, mixed conifer, or lodgepole pine habitats, always in the vicinity of wet meadows. Elevation: 4,500 to 7,500 feet (1,400 to 2,300 meters).	Suitable habitat is present in the project area. This species was detected at Lake Davis in 1999, 2004, and 2005.

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Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
California spotted owl (*Strix occidentalis occidentalis*)		FSS, MIS	CSC	MSCS	In northern California, this species resides in dense, old-growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats, from sea level up to approximately 0 to 7,600 feet (2,300 meters).	Suitable habitat is present within project area. Protected activity centers are designated west of the project area.
Short-eared owl (*Asio flammeus*)			CSC	MSCS	Roosts in dense vegetation, tall grasses, brush, ditches, and wetlands. It is commonly found in treeless areas using fence posts and small mounds as perches. Nests on dry ground in a depression concealed in vegetation, and occasionally in a burrow.	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis.
Greater sage grouse (*Centrocerius urophasianus*)			CSC		This species is found in greatest abundance in a combination of sagebrush, perennial grassland or wet meadow, and water. Bitterbrush and alkali desert scrub also commonly present. Patches of bare ground surrounded by sagebrush stands of moderate canopy are required for courtship displays.	Habitat in the project area is marginally suitable, of limited extent, and fragmented. No historical records or sightings reported for the project area.
White-faced ibis (*Plegadis chihi*)			CSC	MSCS	This species is a rare visitor in the Central Valley, and is more widespread in migration. It prefers to feed in fresh emergent wetland, shallow lakes, and muddy ground of wet meadows and irrigated or flooded pastures and croplands. Nests in dense, emergent wetland.	May occur infrequently as a migrant; it has been observed foraging at Red Clover Creek approximately 2 miles north of Lake Davis. However, the project area is outside of the species' breeding range.
Greater sandhill crane (*Grus canadensis tabida*)		FSS	CT, FP	MSCS	In summer, it occurs in and near wet meadow, shallow lakes, and fresh emergent wetland habitats. In winter, it frequents annual and perennial grassland habitats, moist croplands with rice or corn stubble, and open, emergent wetlands. It prefers relatively treeless plains.	Suitable habitat is present in the project area. Suspected nesting at Red Clover Creek and Little Summit Lake, each within a few miles of Lake Davis.

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Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
California gull (*Larus californicus*)			CSC	MSCS	This species is a fairly common nester at alkali and freshwater lakes east of the Sierra Nevada and Cascades. Inland, this species frequents lakes, rivers, and cropland habitats, landfill dumps, and open lawns in cities.	This species is known to breed at Lake Davis, with as many as several hundred pairs nesting on the Lake Davis island in 2006.
Black tern (*Chlidonias niger*)			CSC	MSCS	Migrant and breeder on wetlands of the northeastern plateau area of California. Although restricted to freshwater habitats while breeding, it can be fairly common on bays, salt ponds, river mouths, and pelagic waters in spring and fall migration.	This species' geographic range is north of the project area. This species is unlikely to occur in the project area and is excluded from further evaluation in this document.
Black swift (*Cypseloides niger*)			CSC		This species nests in moist crevices or caves on sea cliffs above the surf, or on cliffs behind or adjacent to waterfalls in deep canyons. It forages widely over many habitats. In migration, it is rare and irregular outside the breeding range. It does not winter in California.	No suitable nesting habitat within project area. Its potential occurrence at Lake Davis is considered incidental and unpredictable. This species is excluded from further evaluation in this document.
Willow flycatcher (*Empidonax traillii*)		FSS	CE	MSCS	This species is found in wet meadow and montane riparian habitats, most often in broad, open river valleys or large mountain meadows with lush growth of shrubby willows. Elevation: 2,000 to 8,000 feet (600 to 2,500 meters) in the Sierra Nevada range.	Suitable habitat is present within the project area on north and west shores of Lake Davis and along tributary streams. Nesting is known to occur in Red Clover Valley, less than five miles north of the project area. Surveys in the project area in 2006 detected territorial males but did not locate nests.
California horned lark (*Eremophila alpestris actia*)			CSC		Occurs from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitats above treeline. Grasses, shrubs, forbs, rocks, litter, clods of soil, and other surface irregularities provide cover. Feeds on mostly insects, snails, and spiders, but also eats grass and forb seeds and other plant matter.	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis.

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Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Bank swallow (*Riparia riparia*)			CT	MSCS	A neotropical migrant found primarily in or adjacent to riparian and other wetland habitats. In summer, restricted to riparian, lakes, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils, into which it digs nesting holes. Feeds on aerial insects generally over open areas.	Unlikely to occur within project area due to lack of appropriate nesting habitat. May pass through the area during migration though there are no recorded observations from Lake Davis. This species is excluded from further evaluation in this document
Yellow warbler (*Dendroica petechia*)			CSC		Breeds in riparian woodlands (cottonwoods, willows, alders, and other small trees and shrubs typical of low, open-canopy riparian woodland), montane chaparral, and in open ponderosa pine and mixed conifer habitats with substantial amounts of brush from coastal and desert lowlands up to 8,000 feet (2,500 meters).	Suitable habitat is present within the project area. No observations have been reported at Lake Davis; however, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis.
Tricolored blackbird (*Agelaius tricolor*)			CSC	MSCS	This species breeds near fresh water, preferably in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, and tall herbs. Feeds in grassland and cropland habitats.	This species' geographic range is north of the project area. This species is unlikely to occur in the project area and is excluded from further evaluation in this document.
Mammals						
Pallid bat (*Antrozous pallidus*)		FSS	CSC		This species occupies a wide variety of habitats, including grasslands, shrublands, woodlands, and mixed conifer forests, most commonly found in open, dry habitats with rocky areas for roosting. Elevation: sea level through 10,000 feet (3,048 meters).	Suitable habitat is present within the project area.
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)		FSS	CSC		This species is found in all but subalpine and alpine habitats, and may be found at any season throughout its range. Prefers mesic habitats. Gleans insects from brush and trees, and feeds along habitat edges.	Suitable habitat is present within the project area.

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Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Spotted bat (*Euderma maculatum*)			CSC		Habitats occupied by this species range from arid deserts and grasslands through mixed conifer forests. Preferred roost sites are crevices in steep cliffs; feeds over water and along washes. Elevation: 0 to 10,600 feet (0 to 3,230 meters).	Suitable foraging habitat is present within the project area.
Western red bat (*Lasiurus blossevillii*)		FSS			Roosting habitat for this species includes forests and woodlands. It feeds over a wide variety of habitats including grasslands, shrublands, open woodlands and forests, and croplands. It is not found in desert areas. Elevation: below 3,000 feet (900 meters), but may be outside range during migration.	This species may be found as a migrant in the project area. The closest reported occurrence is two to three miles from the project area.
Pygmy rabbit (*Brachylagus idahoensis*)			CSC		This species is found in sagebrush, bitterbrush, and pinyon-juniper habitats, and is associated with tall, dense, large-shrub stages of big sagebrush, greasewood, and rabbitbrush. Elevation: 4,986 to 5,298 feet (1,520 to 1,615 meters).	No suitable habitat is present within the project area, and the project area is outside the species' geographic range. This species is unlikely to occur within the project area and is excluded from further evaluation in this document.
Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*)			CSC		This species is primarily found in montane riparian habitats with thickets of alders and willows, and in stands of young conifers interspersed with chaparral. The early seral stages of mixed conifer, subalpine conifer, red fir, Jeffrey pine, lodgepole pine, and aspen are likely habitats, primarily along edges, and especially near meadows. Elevation: 4,800 to 8,000 feet (1,450 to 2,450 meters).	Suitable habitat is present within the project area and observations of the species have been reported near Lake Davis.

[1]Species Identified by Shading Have Been Determined not to be Present in the Project Area and Have Been Excluded from Further Analysis Within this Document.

Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Western white-tailed jackrabbit (*Lepus townsendii townsendii*)			CSC		A year-round resident of the crest and upper eastern slope of the Sierra Nevada, primarily from the Oregon border south to Tulare and Inyo Counties. Preferred habitats are sagebrush, subalpine conifer, juniper, alpine dwarf-shrub, and perennial grassland.	The project area is outside of the species' geographic range. This species is unlikely to occur in the project area and is excluded from further evaluation in this document.
Sierra Nevada red fox (*Vulpes vulpes necator*)		FSS	CT		This species is found in a variety of habitats from wet meadows to forested areas. It prefers forests interspersed with meadows or alpine fell-fields and uses dense vegetation and rocky areas for cover and den sites. Elevation: 4,000 to 12,000 feet (1,219 to 3,658 meters).	Suitable habitat is present within the project area. This species has been detected 10 to 15 miles from Lake Davis.
California wolverine (*Gulo gulo luteus*)		FSS	CT, FP	MSCS	This species is found in mixed conifer, red fir, and lodgepole habitats, and probably sub-alpine conifer, alpine dwarf shrub, wet meadow, and montane riparian habitats. Elevation: 4,300 to 7,300 feet (1,300 to 2,300 meters).	Suitable habitat is present within the project area. Wolverines have been detected 5 to 15 miles from Lake Davis.
American (=pine) marten (*Martes americana*)		FSS, MIS			Optimal habitats include red fir, lodgepole pine, subalpine conifer, mixed conifer, Jeffrey pine, and east side pine with more than 40 percent crown closure, large trees and snags. Elevation: 5,500 to 10,000 feet (1,676 to 3,048 meters).	Suitable habitat is present within the project area.
Pacific fisher (*Martes pennanti pacifica*)		FSS	CSC		This species occurs in intermediate- to large-tree stages of coniferous forests and deciduous-riparian habitats with a high percent canopy closure. Elevation: 2,000 to 5,000 feet (610 to 1,524 meters).	Suitable habitat is present within the project area. Fishers have been detected about 10 miles from the project area in the Lake Basin area.
American badger (*Taxidea taxus*)			CSC		This species is most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	Potentially suitable habitat is present in the project area though no historic or recent sightings of the species have been reported.

[1]Species Identified by Shading Have Been Determined not to be Present in the Project Area and Have Been Excluded from Further Analysis Within this Document.

Table 7.2-1. Special Status Wildlife Species Potentially Occurring in the General Vicinity of Lake Davis[1]

Species	ESA Status	USFS Status	State Status	Calfed/ MSCS	Habitat Requirements	Potential for Occurrence in Project Area
Mule deer (*Odocoileus hermionus*)		MIS			This species has a widespread distribution throughout most of California, except in deserts and intensively farmed areas without cover.	The Doyle deer herd uses the area around Lake Davis for fawning in spring, migration, and foraging.

ESA Listings
FC = Federal Candidate
FD = Federally Delisted
FE = Federally Endangered
FT = Federally Threatened

USFS Listings
FSS = Forest Service Sensitive
MIS = Management Indicator Species

State Listings
CE = California Endangered
CSC = California Species of Concern
CT = California Threatened
FP = Fully Protected Species

Calfed Listings
MSCS = Multi-Species Conservation Strategy

[1]Species Identified by Shading Have Been Determined not to be Present in the Project Area and Have Been Excluded from Further Analysis Within this Document.

Each special status terrestrial wildlife species potentially occurring in the project area is considered below and included in a project-specific impact analysis. Known occurrences in the vicinity of the project are shown in Figure 7-3.

Mountain Yellow-legged Frog (*Rana muscosa*)

Species Ecology

The mountain yellow-legged frog (*Rana muscosa*) occurs in California in mountainous areas in the Sierra Nevada from Plumas to Tulare counties. This frog is generally found in riparian or wetland habitats in montane, lodgepole pine, or subalpine conifer communities at elevations from approximately 3,425 feet (1,044 meters) to 7,840 feet (2,390 meters) (USFS 2005). The mountain yellow-legged frog is typically associated with near-shore areas of lakes and low gradient (up to 4 percent) perennial streams with irregular shores and rocks. Gravel or rocks are used as egg attachment substrates in shallow water. Breeding does not occur until lakes and streams are ice-free, from June to August at higher elevations (Jennings and Hayes 1994). Preferred food items for adult frogs are primarily aquatic and terrestrial invertebrates. They may also consume the tadpoles of their own and other species. Tadpoles most likely graze on algae and diatoms on the rocky bottoms. Many factors have contributed to the decline of this species, including the introduction of nonnative species (e.g., bullfrogs and sport fish), pesticides, ultraviolet radiation, pathogens, acidification from atmospheric deposition, nitrate deposition, livestock grazing, recreational activities, and drought (Zeiner et al. 1990c).

Status in Project Area

Amphibian and reptile surveys on the Beckwourth Ranger District have been conducted in and around the Lake Davis area in association with the Humbug Project in 2002 (EcoSystems 2002), the Happy Jack Project in 2004 (Mathews and Associates 2004), and the Freeman Project in 2004 (Williams Wildland Consulting 2005). In 2004 and 2005, surveys were conducted by DFG across the Lake Davis project area; additional surveys are on-going through spring and summer 2006 prior to the proposed treatment of Lake Davis (John Hanson, DFG, pers. comm. 2006). No observations of the mountain yellow-legged frog have been recorded. However, suitable habitat for the species is present in the project area, though pike and/or trout are present at some of the best sites. These fish are known to feed on frog eggs, tadpoles, and adults. On the PNF, the mountain yellow-legged frog is found in a few small lakes in the Bucks Lake Wilderness, Lakes Basin, and in several streams throughout the PNF. There is a known population about 10 to 15 miles south of the project area at Wade Lake. A specimen was reported from Big Grizzly Creek at State Highway 70 in 1961 (EcoSystems 2002).

Management Direction

The mountain yellow-legged frog is a candidate for ESA listing, a California species of concern, and a USFS sensitive species. No specific management guidelines for the mountain yellow-legged frog are provided in the SNFPA ROD or the PNF LRMP. The USFS is

directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Foothill Yellow-legged Frog (*Rana boylii*)

Species Ecology

The foothill yellow-legged frog (*Rana boylii*) is found from the Cascade crest south along the western Sierra Nevada to Kern County, from sea level to 6,000 feet elevation (1,830 meters) (Jennings and Hayes 1994). Foothill yellow-legged frogs occur in or near rocky streams within valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow habitats (Stebbins 1985). The foothill yellow-legged frog occurs primarily in shallow channels with riffles and at least cobble-sized substrates. Streams and rivers used by this species have either permanent or intermittent flow, low or high gradient, and alluvial or bedrock channels (DFG 2006h). Breeding takes place at depositional areas with cobbles and boulders at tails/outlets of pools (Lind et al. 1996). Gravel or rocks are used as egg attachment substrates in moving water near stream margins. Breeding and egg laying occur in late spring, between mid-March and May (DFG 2006h). Tadpoles transform about three to four months after hatching (Jennings and Hayes 1994). The adult diet consists primarily of aquatic and terrestrial invertebrates including insects and snails. Tadpoles most likely graze on algae and diatoms on streambeds (DFG 2006h). Foothill yellow-legged frog populations are most vulnerable to declines during the breeding season when individuals are concentrated at breeding sites (DFG 2006h).

Status in Project Area

Amphibian and reptile surveys on the Beckwourth Ranger District have been conducted in and around the Lake Davis area in association with the Humbug Project in 2002 (EcoSystems 2002), the Happy Jack Project in 2004 (Mathews and Associates 2004), and the Freeman Project in 2004 (Williams Wildland Consulting 2005). In 2004 and 2005, surveys were conducted by the DFG across the Lake Davis project area; additional surveys are on-going through spring and summer 2006 prior to the proposed treatment of Lake Davis (John Hanson, DFG, pers. comm. 2006). No observations of the foothill yellow-legged frog have been recorded. Limited suitable habitat as defined by rocky streams (e.g., Big Grizzly Creek below Grizzly Valley Dam) is present in the project area; streams through the meadows lack appropriate substrate and/or adequate water flows (Williams Wildland Consulting 2005). The presence of pike in the project area may have negatively impacted frog populations, as these fish are known to feed on frog eggs, tadpoles, and adults. The Lake Davis watershed may be at the upper elevation limits for the foothill yellow-legged frog; there are few recorded occurrences of this species above 4,000 feet elevation (1,220 meters) (Williams Wildland Consulting 2005). However, there is a 1961 foothill yellow-legged frog record from McNair Meadows in Plumas County at an elevation of 5,000 feet (1,524 meters) (EcoSystems 2002). On the PNF, this species is found in a few of the larger river systems, such as lower portions of the South Fork, Middle Fork, and North Fork Feather River, and Spanish Creek, but has

Figure 7-3 CNDDB Records in the Project Vicinity

Figure 7-3 BACK

also been found in smaller tributary streams of these rivers. There is a known population about 15 miles west of the project area on Spanish Creek.

Management Direction

The foothill yellow-legged frog is a California species of concern and a USFS sensitive species. No specific management guidelines for the foothill yellow-legged frog are provided in the SNFPA ROD or the PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Northwestern Pond Turtle (*Emys [=Clemmys] marmorata marmorata*)

Species Ecology

The northwestern pond turtle (*Emys [=Clemmys] marmorata marmorata*) is found west of the Sierra-Cascade crest. Its elevation range is from sea level to 6,000 feet elevation (1,830 meters). The pond turtle can be found in a variety of habitats, although it is associated with permanent or mostly permanent water sources, which are generally slow-moving (Jennings and Hayes 1994). Microhabitat requirements include open mudbanks, submerged logs, rocks, and vegetation mats used for basking (Jennings and Hayes 1994). Breeding generally occurs from March to August (Zeiner et al. 1990c; Jennings and Hayes 1994). Nests are constructed in sandy banks near large slow streams and may be as far as 325 feet from water (Nussbaum et al. 1983). Eggs are typically laid during May and June, but can be laid from late April through early August (Rathbun et al. 1993). Approximately 3 to 11 eggs are laid and incubated for about 73 to 80 days. Hatchlings likely overwinter in the nest (Jennings and Hayes 1994). In California, reproductive maturity is reached between 7 and 11 years (Jennings and Hayes 1994). The northwestern pond turtle feeds primarily on aquatic plant material and invertebrates. Risk factors for the species include habitat degradation from cattle grazing, roads, and logging near riparian areas. Predation by introduced fish and amphibian species is also an issue in some areas (Zeiner et al 1990c).

Status in Project Area

Amphibian and reptile surveys on the Beckwourth Ranger District have been conducted in and around the Lake Davis area in association with the Humbug Project in 2002 (EcoSystems 2002), the Happy Jack Project in 2004 (Mathews and Associates 2004), and the Freeman Project in 2004 (Williams Wildland Consulting 2005). In 2004 and 2005, surveys were conducted by the DFG across the Lake Davis project area; additional surveys are on-going through spring and summer 2006 prior to the proposed treatment of Lake Davis (John Hanson, DFG, pers. comm. 2006). No observations of the northwestern pond turtle have been recorded. Suitable habitat occurs within most of the slow-flowing streams and ponded waters within the project area. The Lake Davis watershed may be at the upper elevation limits for the northwestern pond turtle; the project area is about 1,500 feet (450 meters) higher in elevation than other recorded occurrences for this species (Williams Wildland Consulting 2005). There is a known population of northwestern pond turtles about 10 to 15 miles west of the project area in American Valley.

Management Direction

The northwestern pond turtle is listed as a California species of concern and a USFS sensitive species. No specific management guidelines for the northwestern pond turtle are provided in the SNFPA ROD or the PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Common Loon (*Gavia immer*)

Species Ecology

The common loon (*Gavia immer*) is found in estuarine and subtidal marine habitats along the California coast from September to May. During the same time period they are occasionally found on large deep lakes in the valleys and foothills of California (Cogswell 1977; Garrett and Dunn 1981). Common loons migrate north to breeding grounds in the northern U.S. and Canada, nesting in territories with deep freshwater lakes, either on small islets, or protected onshore sites (Palmer 1976; Vermeer 1973). Pairs are generally formed before arriving at breeding grounds in April or May. Eggs are laid May to June and are incubated for about 29 days. Clutch size is usually two, although one or three eggs may be laid. Loons generally only raise one brood a season (Palmer 1976). Parental care continues to about 12 weeks when fledglings are capable of flight. Sexual maturity is probably reached around two years of age (DFG 2006h). The preferred food items of the common loon are fish (about 80 percent of diet), crustaceans, and aquatic plants. They also consume snails, leeches, frogs, salamanders, aquatic insects, and occasionally aquatic birds (Palmer 1976). Foraging strategy involves diving from the surface and pursuing prey underwater or taking from the bottom (DFG 2006h).

Status in Project Area

Suitable foraging habitat for the common loon is present in the project area, though there is no appropriate breeding habitat. No project-specific surveys for the common loon have been conducted in the project area; however migratory birds have been observed at Lake Davis.

Management Direction

The common loon is listed as a California species of concern. There is no management direction for the common loon in the PNF LRMP or the SNFPA ROD. The management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines. The common loon is protected under the Migratory Bird Treaty Act (16 USC §703-711).

American White Pelican (*Pelecanus erythrorhynchos*)

Species Ecology

The breeding range for the American white pelican (*Pelecanus erythrorhynchos*) in California is restricted to large lakes in the Klamath Basin, particularly the Clear Lake

National Wildlife Refuge (Sloan 1982). Historically, pelicans bred at Honey Lake (Tait et al.1978), in the Central Valley, and Salton Sea (Cogswell 1977). American white pelicans winter on the salt ponds of the San Francisco Bay, on large lakes and estuaries of the Central Valley, and along the coastal slope from Sonoma County south (Cogswell 1977; Garrett and Dunn 1981). American white pelicans are colonial nesters, with groups from a few to several hundred pairs (DFG 2006a). Nest building begins in March or April in California with eggs laid in April (Cogswell 1977). Nest sites for American white pelicans occur on small islands or remote dikes on large fresh or saltwater lakes and tend to be flat, without flight obstructions, and free of human disturbance (Palmer 1976). Nests may be built up to 184 miles (306 kilometers) from foraging ground. Clutch size ranges from one to six eggs, although the average is two. Incubation is estimated at 36 days and young fledge at three to four weeks (Harrison 1978). White pelicans prey almost exclusively on fish, although they will occasionally take crustaceans or amphibians (Palmer 1976). The pelican dives into the water from the surface and scoops prey into its pouch. Cooperative hunting may occur in shallow water, with small groups "herding" fish close to shore where they are easily caught (DFG 2006h). American white pelicans are susceptible to watershed pollution by persistent pesticides (DFG 2006h).

Status in Project Area

Suitable nonbreeding habitat for the American white pelican is present in the project area. No project-specific surveys have been conducted. However, American white pelicans have been observed foraging at Lake Davis and in the nearby Red Clover Valley at various times of the year, although nesting colonies are not found there. These birds are most likely from the nesting colony at Pyramid Lake, Nevada, approximately 40 miles to the east.

Management Direction

The American white pelican is listed as a California species of concern. There is no management direction for the American white pelican in the PNF LRMP or the SNFPA ROD. The management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines. The American white pelican is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Canada Goose (*Branta canadensis*)

Species Ecology

The Canada goose (*Branta canadensis*) is a widespread migrant and winter resident (October or November to March or April) throughout the Central Valley, Sierra Nevada, Salton Sea, and northeastern California (DFG 2006h). In winter, the Canada goose is found on mountain lakes, though often this species is much less numerous at lakes of the northern Sierra Nevada and Cascade ranges than other mountain lakes (Cogswell 1977; Garrett and Dunn 1981). Preferred nesting habitat includes lakes and reservoirs of 50 acres or greater in size with adjacent foraging habitat of fresh water emergent wetlands and moist grasslands, croplands, pastures, and meadows. In California, the Canada goose nests mainly from March to June

(Cogswell 1977); breeding on the northeastern plateau and in lakes of the northern Sierra Nevada and Cascade Ranges (DFG 2006h). Nest sites are highly variable, but are usually on a firm, dry, slightly elevated site, near water and feeding areas, relatively isolated, with good visibility from the nest. Nests may be in marshes on mats of bulrushes or on muskrat houses; on old raptor or heron nests in trees or snags; on gravel bars, dikes, rock ledges, or haystacks (Palmer 1976). Clutch size ranges from two to nine, averaging five eggs per clutch. Incubation usually lasts approximately 27 to 28 days (Palmer 1976). Precocial young are tended by both parents, first fly at eight to nine weeks, and remain with the parents until the following spring (Palmer 1976). Some breed first at two years, others when older (Palmer 1976). The Canada goose typically roosts on open water of lakes or ponds (DFG 2006h). In California, the Canada goose feeds mainly on green shoots and seeds of cultivated grains and wild grasses and forbs, by grazing and gleaning in moist fields. It also feeds on aquatic plants, and regularly seeks grit (DFG 2006h).

Status in Project Area

Suitable nesting and wintering habitat for the Canada goose is present at Lake Davis. It nests at Lake Davis, with perhaps up to several hundred pairs nesting in 2006 (Glenn Sibbald, DFG, pers. comm. 2006). It may occur at Lake Davis throughout most of the year, though geese are most often observed at the reservoir during migration.

Management Direction

The Canada goose is a USFS management indicator species. There is no management direction provided for the Canada goose in the PNF LRMP or the SNFPA ROD. However, the PNF LRMP has general guidelines for managing management indicator species, which instructs the PNF to maintain and protect habitat for this species. The Canada goose is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Swainson's Hawk (*Buteo swainsoni*)

Species Ecology

The Swainson's hawk (*Buteo swainsoni*) in California is a breeder and migrant in the Central Valley, Klamath Basin, Northeastern Plateau, Lassen County, and Mojave Desert. Very limited breeding has been reported from Lanfair Valley, Owens Valley, Fish Lake Valley, Antelope Valley, and in eastern San Luis Obispo County (Bloom 1980; Garrett and Dunn 1981). Migrating hawks move south through the southern and central interior of California in September and October, and north from March to May (Grinnell and Miller 1944). They are typically found in open desert, grassland, or cropland characterized by scattered, large trees or small groves (DFG 2006h). The Swainson's hawk usually nests in areas with very few trees in juniper-sage flats, riparian zones, agricultural areas, and in oak savannah in the Central Valley. The nests are placed in trees or large shrubs, or sometimes on the ground (England et al 1997). They generally roost in large trees found near water in the Central Valley, but may also nest in arid regions. Breeding occurs late March to late August, with peak activity late May through July (Janes 1987). Clutch size is usually two to three eggs, but

can be as many as four; incubation lasts 25 to 28 days (Beebe 1974). Swainson's hawks eat mice, gophers, ground squirrels, rabbits, large arthropods, amphibians, reptiles, birds, and rarely, fish (Brown and Amadon 1968; Dunkle 1977). They also catch insects and bats in flight (DFG 2006h). Threats to the Swainson's hawk include cropland expansions and development in agricultural and grassland areas. Widespread use of pesticides and rodenticides can cause egg contamination, mortality, and toxic contamination of wintering grounds (Hammerson 1996; Polite 1988).

Status in Project Area

The Swainson's hawk is considered a yearlong resident and migrant in Plumas County (Plumas Audubon Society 2004), though there are no known nesting records from the project area. It is reported nesting in Antelope Valley, which is approximately 10 to 15 miles southeast of Lake Davis.

Management Direction

The Swainson's hawk is listed as a California threatened species and as a USFSsensitive species. There is no management direction for the Swainson's hawk in the PNF LRMP or the SNFPA ROD. The PNF LRMP does instruct the PNF to maintain viability of state-listed species and the management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines. The Swainson's hawk is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Ferruginous Hawk (*Buteo regalis*)

Species Ecology

The ferruginous hawk (*Buteo regalis*) is occasionally found in northeastern California in summer, though there are no breeding records. Ferruginous hawks are winter residents and migrants at low elevations and open grasslands in the Modoc Plateau, Central Valley, and Coast ranges. Ferruginous hawks are found in open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys, and pinyon-juniper habitat edges (Garrett and Dunn 1981). Ferruginous hawks require large, open tracts of grasslands, sparse shrub, or desert habitats with elevated structures for nesting. Nesting usually occurs in foothills or prairies, with nests placed on low cliffs, buttes, cut banks, shrubs, trees, or in other elevated structures, natural or human-made. The ferruginous hawk breeds from Oregon north into Canada, with egg-laying beginning in April (Weston 1969; Olendorff 1973). Clutch size is typically four eggs, but ranges from two to six (Olendorff 1973, Smith and Murphy 1973). Prey mostly includes rabbits, hares, ground squirrels, and mice. They may also hunt birds, reptiles, and amphibians. The ferruginous hawk searches for prey from low flights over open, treeless areas, and glides to intercept prey on the ground. It also hovers and hunts from high mound perches (DFG 2006h). Threats to the ferruginous hawk include habitat loss due to agricultural development and the invasion of exotic annuals, and disturbances by humans during the nesting season that lead to nest abandonment. Poisoning of prey species can be a

threat due to both ingestion of poisoned prey and reduction of prey species (Reichel and Atkinson 1995).

Status in Project Area

The ferruginous hawk is not known to nest in California (DFG 2006a); however, it may use the project area for foraging. No surveys have been conducted for this species in the project area.

Management Direction

This species is listed as a California species of concern. There is no management direction for the ferruginous hawk in the PNF LRMP or the SNFPA ROD. The management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines. The ferruginous hawk is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Osprey (*Pandion haliaetus*)

Species Ecology

The osprey (*Pandion haliaetus*) breeds in northern California from the Cascade Range to Lake Tahoe at inland lakes, reservoirs, and river systems (DFG 2006h). Osprey habitat usually consists of ponderosa pine or mixed conifer forest where there are large, fish-bearing waters. Large trees, snags and broken top trees near large bodies of water are used for foraging and nesting (DFG 2006h). Nests are platforms of sticks on top of large snags, dead-topped trees, cliffs, and man-made structures, usually within 1,312 feet (400 meters) of water but may be as far as 1 mile (1.6 kilometers) from water (Airola and Shubert 1981). The breeding season lasts from March to September and colonial nesting is common. Clutch size is typically three eggs, but ranges from one to four. Osprey begin breeding at 3 years of age (DFG 2006h). Fish are the osprey's preferred prey, although osprey will take mammals, birds, reptiles, amphibians, and invertebrates (DFG 2006h). Declines in the osprey population are attributed to pesticides. In 1975, it was estimated that there were 350 to 400 breeding pairs in northern California. Reproductive success has been on the rise since the 1970s.

Status in Project Area

There is suitable nesting and foraging habitat for the osprey in the project area. As many as 8 to 12 pairs of osprey may nest in the vicinity of Lake Davis each year, however no annual inventory or nest monitoring is conducted.

Management Direction

The osprey is listed as a California species of concern. No specific management guidelines for the osprey are provided in the SNFPA ROD. The PNF LRMP calls for stable and viable

osprey populations through the maintenance of suitable nesting habitat. The osprey is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Bald Eagle (*Haliaeetus leucocephalus*)

Species Ecology

The bald eagle (*Haliaeetus leucocephalus*) is a permanent resident and winter migrant to Plumas County. Habitat requirements for bald eagles include multistoried stands of coniferous forests with some old-growth components (Schultz and Nickerson 2004). Bald eagles also require perches, usually large tree limbs, snags, broken top trees, cliffs, or large rocks near water. Proximity to water is especially important during the breeding season; most nests are located within 1 mile of a large body of water (Schultz and Nickerson 2004).

Breeding sites occur in multilevel, uneven-aged forest stands with between 20 and 40 percent canopy cover. Nests in the PNF are built in ponderosa pine, sugar pine, and Jeffrey pine. Large, live, mature or overmature trees are commonly used for nesting, with eagles often choosing the largest tree in the stand (Schultz and Nickerson 2004). The same breeding area and same nest may be used each year. However, bald eagles may construct several stick platform nests in a single territory for use in different years. Bald eagles are sexually mature around four to six years of age, although they may not breed for up to three years after sexual maturity (USFWS 1986). Courtship, pair bonding, and territory establishment begin as early as January. Clutch size ranges from one to three eggs. Incubation begins late February through mid-March and usually lasts 34 to 36 days. The nestling period may last through June and fledglings are associated with the nest site through August. The breeding cycle, from initial nest activity to fledgling independence is approximately six months (Schultz and Nickerson 2004; USFWS 1986).

Fish is the preferred prey of bald eagles, although they also consume mammals, amphibians, crustaceans, and birds, especially waterfowl. Bald eagles also scavenge fish, water birds, and mammals. Wintering bald eagles far from water may rely more heavily on mammalian prey or carrion, such as big game, livestock, and small mammals (USFWS 1986). Generally, the bald eagle foraging strategy consists of perching on a tree, snag, or rock above a large water source and then swooping or soaring to grab fish from the water. Bald eagles have been observed pouncing or chasing small mammals or birds (USFWS 2004a; DFG 2006h).

Declines in bald eagle populations are attributed to extensive use of the pesticide DDT (Dichloro-diphenyl-trichloroethane) beginning in the 1940s that resulted in unsuccessful hatching and crushed eggs due to weak, calcium-deficient eggshells. Other threats included lead poisoning from eating carrion containing fragments of lead bullets (i.e., in hunter-killed wildlife); deaths from electrocution and collision with overhead transmission lines and related structures (USDI USFWS 1999), logging, recreational development, and disturbance near nest sites from human activities (DFG 2006a). Following the complete ban of DDT use in the United States and other protections through the ESA, eagle numbers have increased steadily (USDI USFWS 1999).

Status in Project Area

Suitable and occupied bald eagle nesting, foraging, and winter roost habitat is present at Lake Davis. Eagles have been nesting at the reservoir since 1978, and are regularly observed during migration and occasionally over winter. Twenty-three bald eagle nesting territories and 17 pairs have been identified on the PNF; not all territories are active every year. Eagle food habits at Lake Davis have not been studied or consistently monitored. The DFG had conducted limited investigations of discarded food waste at nest and roost sites in 2003. At the base of some of these trees, the remains of brown bullheads (*Ameiurus nebulosus*) and unidentifiable fish and waterfowl were found (Schultz and Nickerson 2004).

Nest sites used by eagles at Lake Davis have been identified within four designated eagle primary use areas (i.e., nesting areas) adjacent to the reservoir. Three of these areas are along the western edge of Lake Davis, the fourth at the northeast corner. These primary use areas are variously incorporated into two regularly used nesting eagle territories at Lake Davis. An eagle secondary use area associated with and adjacent to the primary use areas surrounds the west and north sides of the reservoir extending a distance of 1 mile (1,600 meters) adjacent to the upper shoreline of Lake Davis. These areas constitute the approximately 6,240-acre Lake Davis Bald Eagle Habitat Management Area (Schultz and Nickerson 2004), of which 1,311 acres (21 percent) are considered to include suitable nesting habitat.

The two bald eagle nesting territories at Lake Davis are referred to as the Cow Creek territory and the Mosquito Slough territory. The Cow Creek pair was first discovered in 1978; four nests have been associated with this pair. The Cow Creek territory produced a total of 21 fledglings between 1978 and 2006 (including the anticipated successful fledging of one chick in 2006 that was in the nest as of late June). The Mosquito Slough nest was first discovered in 1989; three nests have been associated with this pair. The Mosquito Slough territory produced a total of 16 fledglings between 1989 and 2006. In 2005, a bald eagle was recovered dead at Lake Davis approximately one mile from the Mosquito Slough nest, though it is not known for certain if it was one of the pair nesting in the Mosquito Slough territory. The necropsy results indicated that mortality was due to blunt force trauma. The source of the injury was not evident. In 2006, a new pair of eagles was repeatedly observed near the southwest end of the reservoir, in what may become a new territory, where they displayed some level of nest building and courtship behavior. However, they did not establish an active nest and lay eggs (Glenn Sibbald, DFG, pers. comm. 2006). The occupancy and reproductive history of each of the bald eagle nesting territories is summarized in Table 7.2-2. Lake Davis is the only open water body in Plumas County that supports two nesting pairs of bald eagles.

Table 7.2-2. Occupancy of breeding territories and productivity of bald eagles nesting at Lake Davis from 1978-2006.

Year	Cow Creek Territory			Mosquito Slough Territory		
	Nesting Attempt	Young in Nest	Young Fledged	Nesting Attempt	Young in Nest	Young Fledged
2006	Yes	1	1 anticipated	No New territory?	0	0
2005	Yes	2	2	Yes	0	0
2004	No	0	0	Yes	2	2
2003	Yes	0	0	Yes	0	0
2002	Yes	1	1	Yes	2	2
2001	No	0	0	Yes	2	2
2000	No	0	0	Yes	2	2
1999	Yes	2	2	Yes	1	1
1998	Yes	0	0	Yes	0	0
1997	No data	-	-	Yes	2	2
1996	Yes	0	0	Yes	0	0
1995	Yes	2	2	No	0	0
1994	Yes	2	2	Yes	0	0
1993	Yes	0	0	Yes	1	1
1992	Yes	1	1	No	0	0
1991	Yes	0	0	Yes	1	1
1990	Yes	2	2	Yes	2	2
1989	Yes	1	1	Yes	1	1
1988	Yes	0	0			
1987	Yes	0	0			
1986	Yes	2	2			
1985	Yes	1	1			
1984	Yes	2	2			
1983	Yes	0	0			
1982	Yes	2	2			
1981	Yes	0	0			
1980	No	0	0			
1979	Yes	0	0			
1978	Yes	0	0			

A summary of bald eagle reproduction and productivity at Lake Davis is provided in Table 7.2-3. Since 1982, the first year that bald eagles were reported as successfully nesting at Lake Davis, at least one eagle fledged from a Lake Davis nest in 19 of 25 years (76 percent). A total of 37 fledglings were produced in 23 out of 39 nesting attempts by up to two pairs of eagles, producing 0.95 young per nesting attempt or 1.61 young per successful nesting attempt. Overall, bald eagles at Lake Davis were successful in producing at least one

young in 59 percent of all nesting attempts; and if a nest was successful in raising young, there was a 61 percent probability that that nest would fledge two chicks.

Table 7.2-3. Nesting success parameters for the Cow Creek and Mosquito Slough bald eagle nests at Lake Davis for the years 1982 through 2006.

Nest Territory	Nesting Attempts	Successful Nesting Attempts	Successful Nests with One Fledgling	Successful Nests with Two Fledglings	Total Number of Fledglings	Reproductive Rate (# young per successful nesting attempt)	Reproductive Productivity (# young per nesting attempt)
Cow Creek	24 (of 28 yrs)	13 (54%)	5 (38%)	8 (62%)	21	1.62	0.88
Mosquito Slough	15 (of 18 yrs)	10 (67%)	4 (4%)	6 (60%)	16	1.6	1.1
Total	39 (85% of yrs)	23 (59%)	9 (39%)	14 (61%)	37	1.61	0.95

During the 17 years with data for two nesting pairs at Lake Davis, both pairs initiated nesting the same year 12 times: one pair was successful at fledging young nine times while the other nest failed; both pairs were successful the same year four times; and both pairs failed the same year three times. Both pairs succeeded in raising two young during the same year only once; and a total of three birds were fledged from both nests combined twice. There were six years where only one pair of eagles initiated nesting in that year and each of those nesting attempts was successful, including four resulting in the fledging of two young.

Both eagle nests failed in the same year three times: 1996, 1998, and 2003. Nesting attempts in 2003 failed due to a late winter storm and no data is available to help understand the cause of the 1996 nest failures. Lake Davis was treated with rotenone in 1997 in an attempt to eradicate northern pike. The reservoir was treated in October 1997 and trout were then stocked in July of the next year (1998), resulting in a drastic reduction of the prey base available for bald eagles during the winter of 1997 and the subsequent breeding season. In 1997, the year of, but prior to treatment, two chicks fledged from one nest and no data is available for the other. In 1998, both pairs of eagles attempted nesting but neither pair successfully hatched or fledged young. Although bald eagles are capable of extended flight and may forage at other lakes in the region and feed on terrestrial prey (e.g., rabbits and waterfowl), the nest failures by both pairs in the same year is infrequent enough (3 out of 17 years) to suggest that nesting success at Lake Davis is related to its fishery. In 1999, both eagle pairs nested successfully, with two fledglings at Cow Creek and one at Mosquito Slough (Schultz and Nickerson 2004) suggesting adequate recovery of the Lake Davis fishery by the second year following treatment. However, there is no conclusive proof that the 1998 nesting failures were due to the loss or reduction of the Lake Davis fishery brought about by the rotenone treatment in fall of 1997.

The comparison of nesting success between both nesting territories at Lake Davis suggests that the reservoir can support more than one pair of eagles and that the combined productivity of both nests would exceed that of any one nest. However, in most years there may be some loss of productivity at one nest due to the presence of the other. Therefore, the calculation of productivity per nesting territory is reduced even though there is an overall increase in the number of fledged eagles. In addition, due to the lack of uniquely marked birds for individual identification, it is unknown what the rate of pair turn-over may be, in that new pairs typically have lower reproductive success than experienced birds.

Management Direction

The bald eagle was first listed as a Federal endangered species in 1967 (32 Federal Register 4001). It was reclassified to threatened in the lower 48 states in 1995 (60 Federal Register 35999-36010). In 1999, a proposal to remove listing in the lower 48 states was issued (64 Federal Register 36453-36464). This proposal is currently under review. California is part of the seven-state "Pacific States Bald Eagle Recovery Region." The Pacific States Bald Eagle Recovery Plan (USFWS 1986) established goals for population recovery where average productivity should be 1.0 young fledged per pair with average success rate per occupied site of not less than 65 percent over a 5-year period. The Pacific State Recovery Region has exceeded the overall goal of 800 breeding pairs since 1990 (USFWS 2004b). The Pacific States Bald Eagle Recovery Plan (USFWS 1986) established geographic management areas with target territory and population goals. The Lassen and Plumas Management Zone (Zone 26) in which Lake Davis is found has a target of 41 occupied breeding territories. As of 2005, there were a total of 49 confirmed territories (USFWS 2006).

The bald eagle is also listed as endangered in the State of California and as a Management Indicator Species for the PNF.

The PNF LRMP instructs the PNF to maintain viability of state-listed species and the USFS is directed under the ESA to protect federally listed species. If an action by the PNF may result in an adverse effect to the bald eagle (as measured at the level of the individual), consultation with the USFWS under Section 7 of the ESA is required. While no species-specific bald eagle management direction is identified in the SNFPA ROD, management direction is provided in the PNF LRMP and the Lake Davis Bald Eagle Habitat Management Area Plan. This plan provides a management strategy for bald eagles in the Lake Davis vicinity so that sufficient suitable nesting and foraging habitat is available for bald eagles for the next 25 to 50 years. Management direction for the bald eagle, as provided in the PNF LRMP and the Lake Davis Bald Eagle Habitat Management Area Plan, include the following general project-related resource protection measures:

- Conduct surveys prior to project implementation;
- Disturbance in nesting territories within 0.5 mile (800 meters) of bald eagle nests is to be limited from November 1 through August 31, and also within winter roosting sites from November 1 through March 31, by applying a limited operating period;
- Nest sites are protected from land use practices that will alter or eliminate existing habitat;

- Minimize human disturbance;
- Pest management methods and sanitation salvage silvicultural prescriptions should be chosen that benefit the eagles and their habitat;
- Maintain optimum water quality and habitat conditions to support fish populations;
- Coordinate with the DFG to maintain prey base;
- Maintain and improve waterfowl habitat conditions; and
- Monitor breeding status and wintering populations.

The bald eagle is also protected under the Migratory Bird Treaty Act (16 USC §703-711) and the Bald and Golden Eagle Protection Act. (16 USC §668; 50 CFR Part 22)

Golden Eagle (*Aquila chrysaetos*)

Species Ecology

Golden eagles (*Aquila chrysaetos*) are permanent residents and migrants throughout California (DFG 2006h). Their elevation range is from sea level to 11,500 feet (3,833 meters) (Grinnell and Miller 1944). Breeding habitat tends to be open with nests built on cliffs and in large trees. Foraging habitat generally consists of open terrain such as grasslands, deserts, savannahs, and early successional forest and shrub areas. Nests are large platforms of sticks, twigs, and greenery, often built in rugged, open habitat with canyons and escarpments (DFG 2006h). The breeding season begins in late January and continues through August, with the majority of activity occurring from March through July. Eggs are laid early February to mid-May. Clutch size is typically two eggs, but ranges from one to three, and incubation lasts 43 to 45 days (Beebe 1974). Nestlings remain in the nest 65 to 70 days (DFG 2006h). Golden eagles feed mostly on lagomorphs and rodents, although they also eat other mammals, birds, reptiles, and carrion. Human disturbance during incubation has been associated with nest abandonment (DFG 2006h).

Status in Project Area

Nine golden eagle nesting territories are present on the PNF, three of which are on the Beckwourth Ranger District (USFS 2006a). Those three nesting territories have become inactive, though no recent monitoring for territory occupancy has been completed. Suitable habitat for the golden eagle is present in the project area; however, there are no breeding records from, or nesting territory established within, the project area.

Management Direction

The golden eagle is listed as a California species of concern. No specific management guidelines for the golden eagle are provided in the SNFPA ROD. The PNF LRMP states that breeding habitat protection and maintenance should maintain viable populations of golden eagles. The golden eagle is also protected under the Migratory Bird Treaty Act (16 USC §703-711). It was identified as one of 40 land bird species that are of particular concern by

the USFS Pacific Southwest Regional Forester's office. This species is also protected under the Bald and Golden Eagle Protection Act (16 USC §668; 50 CFR Part 22).

Northern Harrier (*Circus cyaneus*)

Species Ecology

The northern harrier (*Circus cyaneus*) is found from annual grassland up to lodgepole pine and alpine meadow habitats, as high as 10,000 feet (3,000 meters). It breeds from sea level up to 0 to 5,700 feet (1,700 meters) in the Central Valley and Sierra Nevada (DFG 2006h). The northern harrier frequents meadows, grasslands, open rangelands, desert sinks, and fresh and saltwater emergent wetlands, and is seldom found in wooded areas. It is a permanent resident of the northeastern plateau, coastal areas, and Central Valley. In winter, it is a widespread resident and migrant in suitable habitat (DFG 2006h). The northern harrier uses tall grasses and forbs in wetlands, or at the wetland/field border, for cover, and it roosts on the ground (DFG 2006h). It nests on the ground in shrubby vegetation, usually at the edge of a marsh (Brown and Amadon 1968), in emergent wetland or along rivers or lakes, but may nest in grasslands, grain fields, or on sagebrush flats several miles from water (DFG 2006h). Nests are large mounds of sticks on wet areas, and a smaller cup of grasses on dry sites (DFG 2006h). The northern harrier breeds from April to September, with most activity occurring during June and July. Clutch size is typically 5 eggs, but ranges from 3 to 12. Young are in the nest approximately 53 days (Craighead and Craighead 1956). The breeding pair and juveniles may roost communally into late autumn and winter (DFG 2006h). The northern harrier feeds mostly on voles and other small mammals, birds, frogs, small reptiles, crustaceans, insects, and, rarely on fish. It dives from flight or hovers to catch prey. Rarely, it perches and pounces on prey (DFG 2006h).

Status in Project Area

Suitable habitat for the northern harrier is present at Lake Davis and in the project vicinity. No northern harrier observations have been reported at Lake Davis. However, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The northern harrier is listed as a California species of concern. There is no management direction for the northern harrier in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The northern harrier is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Sharp-shinned Hawk (*Accipiter striatus*)

Species Ecology

The sharp-shinned hawk (*Accipiter striatus*) is a migrant and winter resident throughout California, except in areas with deep snow. There are very few breeding records for the Cascades/Sierra Nevada; however, the breeding distribution is poorly documented (DFG 2006h). The sharp-shinned hawk is a permanent resident and breeder in mid-elevation habitats. It prefers, but is not restricted to, riparian habitats; however, north-facing slopes with plucking perches are required. All habitats except alpine, open prairie, and bare desert are used in winter. The sharp-shinned hawk breeds in ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jeffrey pine habitats (DFG 2006h). This hawk usually nests in dense, pole and small-tree stands of conifers, which are cool, moist, well shaded, with little ground-cover, near water. The nest is a platform or cup in dense foliage against a tree trunk, or in the main crotch of a tree (Call 1978). The sharp-shinned hawk breeds from April through August, but mostly from late May to July. Clutch size is typically four to five eggs, but ranges from three to eight. Incubation lasts 34 to 35 days, and fledging occurs at about 60 days (DFG 2006h). The sharp-shinned hawk eats mostly small birds, usually no larger than jays; it also takes small mammals, insects, reptiles, and amphibians. It hunts in low, gliding flights, often foraging in openings at edges of woodlands, hedgerows, brushy pastures, and shorelines, especially where migrating birds are found (DFG 2006h).

Status in Project Area

Suitable habitat for the sharp-shinned hawk is present at Lake Davis and in the project vicinity. No sharp-shinned hawk observations have been reported at Lake Davis. However, it has been documented foraging at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The sharp-shinned hawk is listed as a California species of concern. There is no management direction for the sharp-shinned hawk in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The sharp-shinned hawk is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Cooper's Hawk (*Accipiter cooperii*)

Species Ecology

The Cooper's hawk (*Accipiter cooperii*) is a breeding resident throughout most of the wooded portion of California. It breeds in southern Sierra Nevada foothills, New York Mountains, Owens Valley, and other local areas in southern California (DFG 2006h). The Cooper's hawk ranges from sea level to above 0 to 9,000 feet (2,700 meters) (DFG 2006h). Dense stands of live oak, riparian deciduous, or other forest habitats near water are used most

frequently, and they are seldom found in areas without dense tree stands, or patchy woodland habitat (DFG 2006h). The Cooper's hawk typically nests in trees of second-growth conifer stands or in deciduous riparian areas, usually near streams (DFG 2006h). This species breeds from March through August, with most activity occurring during May through July. Clutch size is typically four to five eggs, but can range from two to six. Females incubate the eggs for 35 to 65 days (Brown and Amadon 1968). The Cooper's hawk feeds on small birds, especially young birds, during the nesting season, and small mammals; it also takes reptiles and amphibians. This species hunts in broken woodland and habitat edges; it catches prey in the air, on the ground, and in vegetation. The Cooper's hawk uses cover to hide, attack, and approach prey; it also soars and makes low, gliding search flights (DFG 2006h).

Status in Project Area

Suitable habitat for the Cooper's hawk is present at Lake Davis and in the project vicinity. No Cooper's hawk observations have been reported at Lake Davis. However, it has been documented foraging at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The Cooper's hawk is listed as a California species of concern. There is no management direction for the Cooper's hawk in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The Cooper's hawk is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Northern Goshawk (*Accipiter gentilis*)

Species Ecology

The northern goshawk (*Accipter gentilis*) is a resident of the Sierra Nevada and Cascade ranges (DFG 2006h). Suitable habitat for goshawks consists of mature, dense conifer, red fir (*Abies magnifica*), ponderosa pine, or deciduous forest interspersed with meadows and riparian areas at mid to high elevations. This habitat provides large trees for nesting, a closed canopy (greater than 50 percent is considered suitable) for protection and thermal cover, and open spaces allowing maneuverability below the canopy (Fowler 1988). Northern goshawks use snags and broken tops as perch sites while foraging (DFG 2006h). Nests tend to be within 0.25 mile of water in the densest part of the stand and are built in large, live trees (DFG 2006h). The nesting season begins in March with nest construction and egg laying. The young are often independent in 70 days. Goshawks are sensitive to disturbance throughout the breeding season but are most sensitive from early March through the incubation period, typically early June. Disturbance may cause nest abandonment. Preferred prey items are robin to grouse-sized birds (Zeiner et al. 1990a), but small mammals are also taken (DFG 2006h).

Status in Project Area

The northern goshawk nests within the PNF where there are 145 established goshawk protected activity centers (PACs). As a result of surveys conducted within the Lake Davis vicinity from 2003 to 2005, eight PACs have been established, three of which are located within the project area. These PACs are located within the forest on the west side of Lake Davis extending beyond the northwest corner of the reservoir. Goshawk activity and young were observed in all three PACs within the project area during the 2005 survey.

Management Direction

The northern goshawk is a USFS sensitive species and a California species of concern. Management direction for the northern goshawk is provided in the SNFPA ROD and the PNF LRMP. However, no specific guidelines are given for this type of project. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. General project-related resource protection measures for the northern goshawk described in the SNFPA FSEIS (USFS 2004) include:

- Conduct surveys during project planning for vegetation treatments that are likely to reduce habitat quality;
- If an activity center (nesting pairs of goshawks, young, etc.) is located within 0.25 mile of proposed disturbance activities, a limited operating period (LOP) may be implemented. A LOP prohibits all activities in the affected area from February 15 to September 15 (SNFPA FSEIS and ROD; USFS 2004a); and
- A new PAC will be created if a new territory is discovered.

Designation of Northern Goshawk Protected Activity Centers

Northern goshawk PACs are delineated around all known and newly discovered breeding territories detected on National USFS lands. Northern goshawk PACs are designated based upon the latest documented nest site and location(s) of alternate nests. If the actual nest site is not located, the PAC is designated based on the location of territorial adult birds or recently fledged juvenile goshawks during the fledgling dependency period.

PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 200 acres of forested habitat in the largest contiguous patches possible, based on aerial photography. Where suitable nesting habitat occurs in small patches, PACs are defined as multiple blocks in the largest best available patches within 0.5 miles of one another. Best available forested stands for PACs have the following characteristics: (1) trees in the dominant and co-dominant crown classes average 24 inches dbh or greater; (2) in west side conifer and east side mixed conifer forest types, stands have at least 70 percent tree canopy cover; and (3) in east side pine forest types, stands have at least 60 percent tree canopy cover. Non-forest vegetation (such as brush and meadows) should not be counted as part of the 200 acres.

As additional nest location and habitat data become available, PAC boundaries are reviewed and adjusted as necessary to better include known and suspected nest stands and to encompass the best available 200 acres of forested habitat.

When activities are planned adjacent to non-national forest lands, available databases are checked for the presence of nearby northern goshawk activity centers on non-national forest lands. A 200-acre circular area, centered on the activity center, is delineated. Any part of the circular 200-acre area that lies on national forest lands is designated and managed as a northern goshawk PAC.

PACs are maintained regardless of northern goshawk occupancy status. PACs may be removed from the network after a stand-replacing event if the habitat has been rendered unsuitable as a northern goshawk PAC and there are no opportunities for re-mapping the PAC near the affected PAC.

Desired Condition

Stands in each PAC have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches diameter at breast height (dbh); and (5) snag and down woody material levels that are higher than average.

Relevant Standards and Guidelines for Northern Goshawk Protected Activity Centers

Within the assessment area or watershed, locate fuels treatments to minimize impacts to PACs. PACs may be re-mapped during project planning to avoid intersections with treatment areas, provided that the re-mapped PACs contain habitat of equal quality and include known nest sites and important roost sites. Document PAC adjustments in biological evaluations.

When treatment areas must intersect PACs and choices can be made about which PACs to enter, use the following criteria to preferentially avoid PACs that likely have the highest contribution to goshawk productivity:

- Lowest contribution to productivity: PACs presently unoccupied and historically occupied by territorial singles only;
- PACs presently unoccupied and historically occupied by pairs;
- PACs presently occupied by territorial singles;
- PACs presently occupied by pairs; and
- Highest contribution to productivity: PACs currently or historically reproductive.

Historical occupancy is considered occupancy since 1990. Current occupancy is based on surveys consistent with survey protocol (March 1992) in the last two to three years prior to project planning. These dates were chosen to encompass the majority of survey efforts and to include breeding pulses in the early 1990s when many sites were found to be productive. When designing treatment unit intersections with PACs, limit treatment acres to those

necessary to achieve strategic placement objectives and avoid treatments adjacent to nest stands whenever possible.

The northern goshawk is protected under the Migratory Bird Treaty Act (16 USC §703-711) and was identified as one of 40 land bird species that are of particular concern by the USFSPacific Southwest Regional Forester's office.

American Peregrine Falcon (*Falco peregrinus anatum*)

Species Ecology

The American peregrine falcon (*Falco peregrinus anatum*) is a very uncommon breeding resident in California with active nesting sites known in the Sierra Nevada and in other mountains of northern California (DFG 2006h). In spring and fall, migrants may occur in the western Sierra Nevada (DFG 2006h). Peregrine falcons require protected cliffs and ledges for cover and nest sites, and tend to nest near wetlands, lakes, rivers, and canyons (DFG 2006h). General breeding areas are in woodland, forest, and coastal habitats, although wetland and riparian habitats are important throughout the year. The nest is usually a scrape on a depression or ledge in an open site, but man-made structures, cavities in trees or snags, and old nests of other raptors are also used (DFG 2006h). Breeding begins in early March and lasts through late August. Clutch size is typically three to four eggs, but ranges from three to seven. Eggs are incubated approximately 32 days (DFG 2006h). The preferred prey items for peregrine falcons are birds, although they will take small mammals, insects and fish. Contamination by the pesticide DDT has been associated with drastic declines in peregrine falcon populations (DFG 2006h).

Status in Project Area

Suitable cliff-site nesting habitat for the peregrine falcon is not present in the project area. Lake Davis does provide appropriate foraging habitat due to the presence of waterfowl, especially during the spring and fall when ducks are there in high numbers. No observations of peregrines have been recorded in the project area even though an occupied nesting site is known within five miles of the reservoir.

Management Direction

The peregrine falcon has been federally delisted, but it is currently listed as a California endangered species and a USFS management indicator species. No specific management guidelines for the peregrine falcon are provided in the PNF LRMP or SNFPA ROD. The PNF LRMP instructs the PNF to maintain viability of state-listed species and the USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. The peregrine falcon is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Prairie Falcon (*Falco mexicanus*)

Species Ecology

The prairie falcon (*Falco mexicanus*) is a permanent resident and migrant to the Sierra Nevada. It is found in grassland, alpine meadow, savannah, rangeland, agricultural, and desert scrub habitats (DFG 2006h). Prairie falcons require sheltered cliff ledges for cover and nesting, and open areas for foraging. Breeding begins in mid-February and continues through mid-September, with most activity occurring from April to early August. Clutch size is typically five eggs, but ranges from three to six. Young begin to disperse in June and July (DFG 2006h). Preferred prey items for prairie falcons include small mammals, some birds, and reptiles. Prairie falcons are vulnerable to DDT pesticide use (DFG 2006h).

Status in Project Area

Prairie falcons nest on rock cliffs in the PNF, with nine known nesting eyries. The Beckwourth Ranger District has five known nesting areas and one suspected site. Suitable nesting habitat for the prairie falcon is not present within the immediate project area, although there is a nesting site near Lake Davis. This site has not been used by prairie falcons for the last three years, though multiple sightings have been recently documented throughout the project area. These may be of nonbreeding individuals or of birds nesting at an unknown location.

Management Direction

The prairie falcon is listed as a California species of concern. General management direction for the prairie falcon as provided in the PNF LRMP is to maintain species viability by maintaining suitable nesting territories. No specific management guidelines for the prairie falcon are provided in the SNFPA ROD. The prairie falcon is protected under the Migratory Bird Treaty Act (16 USC §703-711). The prairie falcon was identified as one of 40 land bird species that are of particular concern by the USFS Pacific Southwest Regional Forester's office.

Great Gray Owl (*Strix nebulosa*)

Species Ecology

The great gray owl (*Strix nebulosa*) is a resident species within the Sierra Nevada Range in Plumas County (DFG 2006h). Great gray owl habitat is characterized by old-growth red fir, mixed conifer, or lodgepole pine stands near wet meadows from 2,250 to 11,000 feet elevation (686 to 3,353 meters elevation). Wet meadows are important foraging sites (DFG 2006a). Nests are built in large snags or broken topped trees in mature conifer habitat adjacent to well-watered meadows or other open foraging habitat, usually from 4,000 to 7,000 feet (1,220 to 2,135 meters) in elevation (DFG 2006h). The nesting season begins in March to early April with the establishment of territories. Nest trees or snags are red fir and white fir snags (Winter 1986), but platforms such as old hawk nests and witches brooms are also used. The young will fledge 26 to 28 days after hatching, typically in June, but remain

around the nest through August. Great gray owls prey upon rodents and occasionally birds. The main prey items are pocket gophers and voles (Greene 1995). Populations have declined due to habitat loss and fragmentation. Food supply has been indicated as a critical factor tied to regulating populations. Some studies estimate only 50 pairs of great gray owls remain in California (DFG 2006h).

Status in Project Area

Suitable great gray owl habitat exists throughout the project area. Prior to 1999; however, the last known great gray owl from the Beckwourth Ranger District was recorded along Blakeless Creek in 1937 (Winter 1986). Surveys for the great gray owl were conducted within and adjacent to the project area in 2004 and 2005. These surveys recorded 13 great gray owl detections in 2004 and 20 detections in 2005 near and within the project area. PACs were established at three detection sites, two of which are adjacent to the west side of Lake Davis and the other northwest of the reservoir. To date, however, no great gray owl nesting pairs have been confirmed and no nests have been located in the vicinity of Lake Davis.

Management Direction

- The great gray owl is listed as a California endangered species and a USFS sensitive species. Management direction for the great gray owl is provided in the SNFPA ROD and the PNF LRMP. However, no specific guidelines are given for this type of project. The PNF LRMP does instruct the PNF to maintain viability of State-listed species and the USFSis directed under the National Forest Management Act to maintain viable populations of designated sensitive species. General project-related resource protection measures for the great gray owl described in the SNFPA FSEIS (USFS 2004) include: Conduct surveys prior to project implementation.
- If an activity center (a nesting pair of great gray owls, young, etc.) is located within 0.25 mile of proposed treatment activities, a limited operating period (LOP) may be implemented. A LOP prohibits all treatment activities in the affected area from March 1 to August 31 (SNFPA FSEIS and ROD; USFS 2004a).
- A new PAC will be created if a new territory is discovered.

Designation of Great Gray Owl Protected Activity Centers

Great gray owl PACs are established and maintained to include the forested area and adjacent meadow around all known great gray owl nest stands. The PAC encompasses at least 50 acres of the highest quality nesting habitat (CWHR types 6, 5D, and 5M) available in the forested area surrounding the nest. The PAC also includes the meadow or meadow complex that supports the prey base for nesting owls.

Desired Condition

Meadow vegetation in great gray owl PACs supports a sufficiently large meadow vole population to provide a food source for great gray owls through the reproductive period.

Relevant Forest Plan Standards and Guidelines

Apply a limited operating period (LOP), prohibiting vegetation treatments and road construction within 0.25 mile of an active great gray owl nest stand, during the nesting period (typically March 1 to August 15). The LOP may be waived for vegetation treatments of limited scope and duration, when a biological evaluation determines that such projects are unlikely to result in breeding disturbance considering their intensity, duration, timing and specific location. Where a biological evaluation concludes that a nest site would be shielded from planned activities by topographic features that would minimize disturbance, the LOP buffer distance may be reduced.

In meadow areas of great gray owl PACs, maintain herbaceous vegetation at a height commensurate with site capability and habitat needs of prey species. Follow regional guidance to determine potential prey species and associated habitat requirements at the project level.

The great gray owl is also discussed in Section 8, Land Use and Management. The great gray owl is protected under the Migratory Bird Treaty Act (16 USC §703-711 and it was identified as one of 40 land bird species that are of particular concern by the USFS Pacific Southwest Regional Forester's office.

California Spotted Owl (*Strix occidentalis occidentalis*)

Species Ecology

The California spotted owl (*Strix occidentalis occidentalis*) is a permanent resident in dense, old-growth, mixed conifer, redwood, ponderosa pine, and Douglas fir forests of northern California, found from sea level up to 7,600 feet elevation (2,300 meters) (Pearson and Livezey 2003). The nesting season begins in February with pair bonding, and ends in September when the young are able to feed themselves (Verner et al. 1992). Nests are generally built in a tree or snag cavity or in a broken top of a large tree. Nesting habitat is characterized by dense canopy closure (greater than 70 percent) with medium to large trees and multi-storied structure (Call 1978). Breeding begins in early March and lasts through June with most activity occurring in April and May. Clutch size is typically two eggs, but ranges from one to four. These owls may not breed until three years of age (DFG 2006h). The favored prey item is the northern flying squirrel, though spotted owls are also known to prey on mice, pocket gophers, moles, voles, and shrews, as well as rabbits, bats, birds, and insects. Declines in spotted owls are attributed to habitat loss and fragmentation (DFG 2006h).

Status in Project Area

The California spotted owl is found within the PNF. Two Areas of Concern, which are designated to indicate where the greatest potential for problems would be if the owl's status deteriorates, have been identified adjacent to the PNF on the Lassen National Forest (Verner et al. 1992). No Areas of Concern were identified in the Beckwourth Ranger District.

California spotted owl surveys have been conducted intermittently from 1991 to 2005 adjacent to and within the Lake Davis project area. Suitable spotted owl habitat has been identified in forested areas immediately north and west of Lake Davis, and two PACs have been designated in this area. One PAC was established in 1991 following the detection of one adult pair. No surveys of this PAC occurred until 2005 when one adult male was detected outside but near the designated PAC boundary. The other PAC was also established in 1991 following detection of a pair of birds. A pair was detected using this PAC for the next two years. Subsequent surveys only detected a single adult female within the PAC. These PACs are located on the west side of Lake Davis, one near Dan Blough Creek below Smith Peak and the other one parallels Cow Creek near Threemile Rock.

Management Direction

The California spotted owl is a USFS sensitive species and a California species of concern. Management direction for the California spotted owl is provided in the SNFPA ROD and the PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. Most of the Standards and Guidelines for spotted owl pertain to forest management activities, and therefore, are not mentioned here. General project-related resource protection measures for the California spotted owl described in the SNFPA FSEIS (USFS 2004a) include:

- Conduct surveys during project planning for vegetation treatment projects likely to reduce habitat quality;
- A limited operating period (LOP) from March 1 through August 31 may be required where active nests sites have been located within 0.25 mile of project activities;
- A new PAC and Home Range Core Area will be created if a new territory is discovered; and
- Mitigate impacts where there is documented evidence of disturbance to the nest site from existing recreation, off-highway vehicle (OHV) route, trail, and road uses (including road maintenance). Evaluate proposals for new roads, trails, OHV routes, and recreational and other developments for their potential to disturb nest sites.

Designation of California Spotted Owl Protected Activity Centers

California spotted owl PACs are delineated surrounding each territorial owl activity center detected on National Forest Service lands since 1986. Owl activity centers are designated for all territorial owls based on: (1) the most recent documented nest site, (2) the most recent known roost site when a nest location remains unknown, and (3) a central point based on repeated daytime detections when neither nest or roost locations are known.

PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 300 acres of habitat in as compact a unit as possible. The best available habitat is selected for California spotted owl PACs to include: (1) two or more tree canopy layers; (2) trees in the dominant and co-dominant crown classes averaging 24 inches diameter at breast height (dbh) or greater; (3) at least 70 percent tree canopy cover (including hardwoods); and (4) in descending order of priority, California Wildlife Habitat

Relationships (CWHR) classes 6, 5D, 5M, 4D, and 4M and other stands with at least 50 percent canopy cover (including hardwoods). Classes in the CWHR are indicative of tree size and age; the higher the number the higher the age and diameter of the trees. Aerial photography interpretation and field verification are used as needed to delineate PACs.

As additional nest location and habitat data become available, boundaries of PACs are reviewed and adjusted as necessary to better include known and suspected nest stands and encompass the best available 300 acres of habitat.

When activities are planned adjacent to non-national forest lands, available databases are checked for the presence of nearby California spotted owl activity centers on non-national forest lands. A 300-acre circular area, centered on the activity center, is delineated. Any part of the circular 300-acre area that lies on national forest lands is designated and managed as a California spotted owl PAC.

PACs are maintained regardless of California spotted owl occupancy status. However, after a stand-replacing event, evaluate habitat conditions within a 1.5-mile radius around the activity center to identify opportunities for re-mapping the PAC. If there is insufficient suitable habitat for designating a PAC within the 1.5-mile radius, the PAC may be removed from the network.

Desired Conditions

Stands in each PAC have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average.

Relevant Standards and Guidelines for California Spotted Owl Protected Activity Centers

Within the assessment area or watershed, locate fuels treatments to minimize impacts to PACs. PACs may be re-mapped during project planning to avoid intersections with treatment areas, provided that the re-mapped PACs contain habitat of equal quality and include known nest sites and important roost sites. Document PAC adjustments in biological evaluations.

When treatment areas must intersect PACs and choices can be made about which PACs to enter, use the following criteria to preferentially avoid PACs that likely have the highest contribution to owl productivity:

- Lowest contribution to productivity: PACs presently unoccupied and historically occupied by territorial singles only;
- PACs presently unoccupied and historically occupied by pairs;
- PACs presently occupied by territorial singles;
- PACs presently occupied by pairs; and
- Highest contribution to productivity: PACs currently or historically reproductive.

Historical occupancy is considered occupancy since 1990. Current occupancy is based on surveys consistent with survey protocol (March 1992) in the last two to three years prior to project planning. These dates were chosen to encompass the majority of survey efforts and to include breeding pulses in the early 1990s when many sites were found to be productive. When designing treatment unit intersections with PACs, limit treatment acres to those necessary to achieve strategic placement objectives and avoid treatments adjacent to nest stands whenever possible.

The California spotted owl is also discussed in Section 8, Land Use and Management. The California spotted owl is protected under the Migratory Bird Treaty Act (16 USC §703-711).

Short-eared Owl (*Asio flammeus*)

Species Ecology

The short-eared owl (*Asio flammeus*) is a winter migrant, found primarily in the Central Valley, in the western Sierra Nevada foothills, along the coastline, and in southern California, including the Channel Islands (Garrett and Dunn 1981). Occasionally still breeds in northern California (McCaskie et al. 1988). Breeding range includes coastal areas in Del Norte and Humboldt counties, the San Francisco Bay Delta, northeastern Modoc plateau, the east side of the Sierra Nevada from Lake Tahoe south to Inyo County, and the San Joaquin Valley. This species roosts in dense vegetation, tall grasses, brush, ditches, and wetlands (Grinnell and Miller 1944). It is commonly found in treeless areas using fence posts and small mounds as perches. The short-eared owl nests on dry ground in a depression concealed in vegetation, and lined with grasses, forbs, sticks, and feathers; occasionally it will nest in a burrow (Holt 1992). This species breeds from early March through July (Bent 1938). Clutch size is typically five to seven eggs, but can range from 4 to 14, and is higher in years with a high prey population. Eggs are laid in April and May and are incubated by the female for 21 to 28 days. Young fledge at 31 to 36 days (Urner 1923). The short-eared owl feeds primarily on voles and other small mammals (Bent 1938, Earhart and Johnson 1970). Birds are an important food source in coastal wintering areas, and in the nesting season. The short-eared owl also eats reptiles, amphibians, and arthropods. It frequently searches in low, gliding flight above the ground; swoops and pounces; and also hunts from a perch (DFG 2006h). Numbers have declined over most of the range in recent decades because of destruction and fragmentation of grassland and wetland habitats, and grazing (Remsen 1978). Increased levels of predation on this ground nester may have also contributed to its decline (Holt and Leasure 1996).

Status in Project Area

Suitable habitat for the short-eared owl is present at Lake Davis and in the project vicinity. The short-eared owl has not been observed at Lake Davis. However, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The short-eared owl is listed as a California species of concern. There is no management direction for the short-eared owl in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The short-eared owl is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

White-faced Ibis (*Plegadis chihi*)

Species Ecology

The white-faced ibis (*Plegadis chihi*) is commonly found in California during migration but no longer breeds regularly anywhere in California (Remsen 1978). Although rare, the white-faced ibis can be found on the northeastern plateau from April to September (McCaskie et al. 1979). This species roosts amidst dense, freshwater emergent vegetation such as bulrushes, cattails, reeds or low shrubs over water (Ryder and Manry 1994). Extensive marshes are required for nesting (Garrett and Dunn 1981). Nests, made of dead tules or cattails, are built amidst tall marsh plants, sometimes on mounds of vegetation. According to Cogswell (1977), the white-faced ibis rarely nests in trees, but it is not clear whether tree nesting has been recorded in California. Grinnell and Miller (1944) and Harrison (1978) did not mention tree nesting by this species. Eggs have been observed in the nest from May to July. Three to five eggs are laid and incubated for 21 days. Young remain in or near the nest for approximately five weeks (Cogswell 1977). The white-faced ibis forages in fresh emergent wetland, shallow lacustrine waters, muddy ground of wet meadows, and irrigated or flooded pastures and croplands. It eats earthworms, insects, crustaceans, amphibians, small fishes, and miscellaneous invertebrates by probing deep in the mud with its long bill, and by feeding in shallow water or on the water's surface (Cogswell 1977). The white-faced ibis has declined in California and stopped breeding regularly, probably from destruction of extensive marshes required for nesting (Remsen 1978). Elsewhere in its range, pesticides have caused a decline in numbers (Terres 1980).

Status in Project Area

Suitable foraging habitat for the white-faced ibis is present at Lake Davis and in the project vicinity. The white-faced ibis has not been observed at Lake Davis. However, it has been documented foraging at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The white-faced ibis is listed as a California species of concern. There is no management direction for the white-faced ibis in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The white-faced ibis is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Greater Sandhill Crane (*Grus canadensis*)

Species Ecology

The greater sandhill crane (*Grus canadensis*) breeds in California in Plumas and Sierra counties (James 1977; Remsen 1978). This species roosts communally, and requires marshes, grain fields, or irrigated pastureland near a shallow body of water. Breeding habitat is generally wet meadow, shallow lakes or ponds, and fresh water emergent wetland. Nests are built in remote portions of extensive wetlands (Cogswell 1977), or sometimes in shortgrass prairies (Eckert and Karalus 1981). On dry sites, nests are scooped-out depressions lined with grasses. More commonly, nests are large mounds of wetland plants, in shallow water. Natural hummocks or muskrat houses are often used. Ideal sites are on small islands screened by tall tules, cattails, or shrubs (Harrison 1978). Courtship begins in April with elaborate dancing behaviors that often include 50 to 80 individuals (Eckert and Karalus 1981). Peak breeding occurs from May until July, and nesting is complete by late August. The greater sandhill crane is a solitary nester. Clutch size is typically two eggs, but ranges from one to three (Harrison 1978). Incubation lasts approximately 30 days (Johnsgard 1975). Young are precocial, and parents often separate chicks. If chicks are raised together, antagonism between them may reduce reproductive success to one chick per year (Johnsgard 1975). Young fly at about 70 days, but remain with their parents up to a year (Harrison 1978). Greater sandhill cranes do not breed until they are four years old (Johnsgard 1975). Greater sandhill cranes forage in shortgrass plains, grain fields, and wetlands (Grinnell and Miller 1944) for grasses, forbs, roots, tubers, seeds, grains, earthworms, and insects. Fruits and berries are eaten, if available (Eckert and Karalus 1981). Population size has been greatly reduced and greater sandhill cranes are extremely rare outside wintering grounds. Declines are attributed to livestock grazing and human disturbance during nesting (DFG 2006h).

Status in Project Area

Suitable habitat for the greater sandhill crane is present at Lake Davis and in the project vicinity. The greater sandhill crane does occur on the PNF during the summer breeding season and during migration. It is found in medium to large wetlands and short grass valley bottoms. The east side of the PNF has numerous meadows with suitable habitat and several sightings during the breeding season where courtship activities have been observed but no documented nesting (USFS 2006a). In 2006, one pair of sandhill cranes were observed at Summit Lake, a wetland area at the head of the Grizzly Creek watershed about 3.5 miles above Lake Davis (Glenn Sibbald, DFG, pers. comm. 2006). The nearest known nesting location is in Red Clover Valley about two miles north of Lake Davis (DWR 1993).

Management Direction

The greater sandhill crane is listed as a California threatened species and a USFS sensitive species. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. Management direction for the greater sandhill crane is not provided in the SNFPA ROD. The PNF LRMP instructs the PNF to maintain viability of state-listed species and calls for maintenance of greater sandhill crane populations

through surveying and habitat protection. The greater sandhill crane is protected under the Migratory Bird Treaty Act (16 USC §703-711).

California Gull (*Larus californicus*)

Species Ecology

The California gull nests in alkali and freshwater habitats east of the Sierra Nevada and Cascade ranges. California's nesting population is scattered across the northeastern plateau region and at Mono Lake from April through late summer (Grinnell and Miller 1944). Evidence of former breeding exists for the Central Valley (Dawson 1923). In late summer, California gulls migrate westward across the Sierra Nevada from interior nesting grounds to winter in California and the Pacific Northwest (Cogswell 1977). Wintering birds are abundant at coastal and interior lowlands (Grinnell and Miller 1944). Preferred habitats along the coast are sandy beaches, mudflats, rocky intertidal zones, and pelagic areas of marine and estuarine habitats, as well as fresh and saline emergent wetlands. Inland, this species is frequently found in lacustrine, riverine, and cropland habitats, as well as at landfill dumps and on open lawns in cities (Grinnell and Miller 1944). California gulls are colonial nesters and they need undisturbed, isolated islands on alkali or freshwater lakes or salt ponds for nesting. These birds begin breeding in their third year. Clutch size is typically two eggs, although it ranges from one to three (Harrison 1978). California gulls generally raise one brood a year. Incubation lasts from 23 to 27 days. Young birds are capable of flight 35 to 41 days after hatching (Smith and Diem 1972). The young are fed larval insects, brine shrimp, young birds, garbage, earthworms, and insects (Vermeer 1970). In winter, this omnivore forages in landfill dumps, fields, and pastures, feeding on garbage, carrion, earthworms, adult insects, and larvae (Vermeer 1970). The DFG (2006a) reports that in California the California gull breeds at Mono Lake (25,000 pairs in 1977); Goose Lake, Modoc County (600 pairs in 1977); the Klamath Basin refuges (1,000 pairs); and Hartson Reservoir, Honey Lake Wildlife Area (500 to 700 pairs). This species no longer breeds at Eagle Lake, Lassen County, nor in the Sutter Basin where there is some evidence of former breeding. The Mono Lake colony is at least the second largest colony of this species in the world.

Status in Project Area

Suitable nesting and foraging habitat for the California gull is present in the project area. California gulls nest on the island in Lake Davis on an exposed escarpment where there is little shrubby vegetation. In 2006, an estimated 150 pairs of California gulls were nesting on the island intermixed with an equal number of ring-billed gulls (*Larus delawarensis*) (Joel Schultz, USFS, pers. comm. 2006).

Management Direction

The California gull is listed as a California species of concern. There is no management direction for the California gull in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or

reversing population declines. The California gull is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Willow Flycatcher (*Empidonax traillii*)

Species Ecology

The willow flycatcher (*Empidonax traillii*) is a rare to locally uncommon summer resident in the Sierra Nevada and Cascade ranges, found from elevations of 2,000 feet elevation (600 meters) up to 8,000 feet elevation (2,500 meters). Wet meadow and montane riparian habitats are commonly used in foraging and breeding. Wet meadows with willows (*Salix* spp.) appear to be the most important habitat, but dense riparian deciduous shrubs, primarily willows, along streams are also used for nesting (Stafford and Valentine 1985; Sanders and Flett 1989; Bombay 1999). The nesting period can begin as early as June 1 and extend through August 31. Open cup nests are constructed in an upright fork of a willow or other shrub 1.5 to 10 feet (0.5 to 3 meters) above the ground (DFG 2006h). Clutch size is three to four eggs, and incubation lasts 12 to 13 days. Young fledge after 13 to 14 days (DFG 2006h). Flying insects make up the bulk of the willow flycatcher diet, although berries and seeds are also consumed (Bent 1942). Some of the terrestrial insects that are consumed include adult-phase aquatic macroinvertebrates, including midges, mayflies, and other Dipteran species. Threats to willow flycatcher populations include brood parasitism by brown-headed cowbirds, habitat loss and fragmentation, and livestock grazing of willow thickets (DFG 2006h).

Status in Project Area

On the west side of the PNF, willow, alder, and willow-alder communities are the most likely habitats to support willow flycatchers (Wilson and Cougoulat 1995). There are eight known willow flycatcher nest sites on the Beckwourth Ranger District. With known sites along the Middle Fork Feather River near Delleker, approximately five miles south from the project area (USFS 2005) and north of Lake Davis along Red Clover Creek approximately 1.5 miles (Joel Schultz, USFS, pers. comm. 2006). Potential willow flycatcher habitat is located within and adjacent to the project area on the west side of Lake Davis along Big Grizzly Creek, Freeman Creek, Cow Creek, and Dan Blough Creek. Potential habitat is also found at tributary streams on the east side of Lake Davis approximately one mile south of Lightning Tree Point. Surveys for willow flycatcher conducted adjacent to and within the project area in 2005 did not detect the species (Joel Schultz, USFS, pers. comm. 2006); however, in 2006 two singing males were located though nests were not found (Joel Schultz, USFS, pers. comm. 2006).

Management Direction

The willow flycatcher is listed as a California endangered species and a USFS sensitive species. No specific management guidelines for the willow flycatcher are provided in the SNFPA ROD or the PNF LRMP. Standards and Guidelines for willow flycatcher are discussed here. The PNF LRMP instructs the PNF to maintain viability of state-listed species and the USFS is directed under the National Forest Management Act to maintain viable

populations of designated sensitive species. General project-related resource protection measures for the willow flycatcher include:

- Conduct surveys prior to project implementation.
- If willow flycatchers are detected during surveys, a limited operating period (LOP) may be applied within occupied emphasis sites.

Definitions of Willow Flycatcher Site Occupancy

Occupied Willow Flycatcher Site: a site where willow flycatcher(s) have been observed sometime during the breeding season since 1982. For a site to be designated as an occupied site, it must meet the following criteria:

Observation date(s) between 1982 and 2000:

- Willow flycatcher observed between June 15 and August 1; or
- Willow flycatcher observed between June 1 and June 14 or August 2 and August 15, unless the willow flycatcher was:
  - Absent during surveys conducted between June 15 and July 15 in the same year;
  - Absent during June 15 -July 15 surveys in multiple subsequent years; or
  - Detected at a site that is clearly outside of known habitat requirements.

For inclusion as an occupied willow flycatcher site, willow flycatcher(s) must be identified by the Fitz-bew song or in-hand examination. Museum skins that are identified as willow flycatchers may also be used if the collection date falls within the range of dates listed above.

Nests and egg sets in museum collections infer site occupancy, regardless of collection month and day.

All sites where willow flycatchers were identified using these criteria are included in the dataset, unless the site is known to have undergone an extreme site conversion rendering it incapable of supporting willow flycatchers currently and in the future (e.g., wetland conversions or inundation by reservoir).

Observation date(s) in 2001 or later:

- Willow flycatcher site occupancy will be determined based upon the criteria defined in the standardized protocol.
- Historically Occupied Willow Flycatcher Site: a site where occupancy is only known from pre-1982 or one that has been surveyed for at least six years over a 10-year period and consistently found to contain no willow flycatchers during the breeding season. For a site to be designated as historically occupied, it must meet the following criteria:
  - Sighting meets the criteria of an occupied willow flycatcher site but the most recent date of detection is prior to 1982; or

- Surveys across a minimum of six separate years during a 10-year period must have been performed (alternatively, surveys may be conducted annually for six years within a six- to 10-year period).

Surveys conducted since June 2000 must be in compliance with the current standardized willow flycatcher survey protocol guidelines.

If a historically occupied site is determined as occupied, the site is upgraded to occupied status until or unless the site meets the definition of historically occupied again.

Conditionally Occupied Willow Flycatcher Site: a site documented in the willow flycatcher database at the time of the ROD that does not meet the criteria for an occupied site or a historically occupied site. For these sites, either the month and date of detection are not known or the month and date occur outside of the breeding season as defined in the survey protocol.

There are five sites in the existing database where survey documentation necessary to determine if the observation meets the criteria for an occupied site is missing or incomplete. These sites are assigned to a temporary category of conditionally occupied until they either receive one survey cycle or the missing information is discovered and documented, at which time either they will be found to be occupied or they will be dropped from the database. Once these sites are resolved, this category is no longer used.

Willow Flycatcher Standards and Guidelines

For occupied and historically occupied willow flycatcher sites: Initiate a four-year cycle for willow flycatcher surveys. Conduct surveys according to established protocols in all sites the first year. Second year surveys will be conducted in those sites where willow flycatchers were not found. Surveys will not be conducted in the third and fourth years. The survey cycle will then be repeated. For conditionally occupied sites: Surveys will be conducted in the first year. If willow flycatchers are found, these sites will be managed as occupied sites. If not found, these sites will be surveyed in the second year. If birds are not found in the second year, these sites will be dropped from the willow flycatcher site database.

In meadows with occupied willow flycatcher sites, allow only late-season grazing (after August 15) in the entire meadow.

The above Standard and Guideline may be waived if an interdisciplinary team has developed a site-specific meadow management strategy. This strategy is to be developed and implemented in partnership with the affected grazing permittee. The strategy objectives must focus on protecting the nest site and associated habitat during the breeding season and the long-term sustainability of suitable habitat at breeding sites. It may use a mix of management tools, including grazing systems, structural improvements, and other exclusion by management techniques to protect willow flycatcher habitat.

In willow flycatcher sites receiving late-season grazing, utilization must be monitored annually using a regional range analysis and planning guide. Monitor willow flycatcher habitat every three years using the following criteria: rooting depth cores for meadow condition, point intercepts for shrub foliar density, and strip transects for shrub recruitment and cover. Meadow condition assessments will be included in a GIS meadow coverage. If

habitat conditions are not supporting the willow flycatcher or trend downward, modify or suspend grazing.

For historically occupied willow flycatcher sites, assess willow flycatcher habitat suitability within the meadow. If habitat is degraded, develop restoration objectives and take appropriate actions (such as physical restoration of hydrological components, limiting or re-directing grazing activity, and so forth) to move the meadow toward desired conditions.

Evaluate site condition of historically occupied willow flycatcher sites. Those sites that no longer contain standing water on June 1 or a deciduous shrub component, and cannot be reasonably restored, may be removed from the willow flycatcher site database.

As part of the project planning process, survey emphasis habitat within five miles of occupied willow flycatcher sites to determine willow flycatcher occupancy. Emphasis habitat is defined as meadows larger than 15 acres that have standing water on June 1 and a deciduous shrub component. Use established protocols to conduct these surveys. If these surveys determine willow flycatcher occupancy, add these to the database of occupied willow flycatcher sites and include them in the four-year survey cycle of willow flycatcher sites described above.

Evaluate proposals for new concentrated stock areas (for example, livestock handling and management facilities, pack stations, equestrian stations, and corrals) located within five miles of occupied willow flycatcher sites.

The willow flycatcher is also discussed in Section 8, Land Use and Management. The willow flycatcher is protected under the Migratory Bird Treaty Act (16 USC §703-711) and was identified as one of 40 land bird species that are of particular concern by the USFS Pacific Southwest Regional Forester's office.

California Horned Lark (*Eremophila alpestris actia*)

Species Ecology

The California horned lark (*Eremophila alpestris actia*) is a resident in a variety of open habitats in California, usually where trees and large shrubs are absent. It is found from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitats above treeline (McCaskie et al. 1979). During the winter, flocks in desert lowlands and other areas are augmented by winter visitants, many migrating from outside California (Garrett and Dunn 1981). Grasses, shrubs, forbs, rocks, litter, clods of soil, and other surface irregularities provide cover for this species (DFG 2006h). The California horned lark builds cup-shaped, grass-lined nests in depressions on the ground in open areas (DFG 2006h). This lark breeds from March through July, with most activity occurring in May. Pairs nest solitarily. Clutch size is typically three to four eggs, but ranges from two to five. The California horned lark frequently raises two broods in a season (Bent 1942). Incubation lasts 10 to 14 days. Young fledge at 9 to 12 days, and can fly three to five days later (Harrison 1978). The California horned lark eats mostly insects, snails, and spiders during breeding season. It adds grass and forb seeds and other plant matter to its diet during other seasons (Bent 1942). The California horned lark searches for food along the ground.

Status in Project Area

Suitable habitat for the California horned lark is present at Lake Davis and in the project vicinity. The California horned lark has not been observed at Lake Davis. However, it has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley, during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The California horned lark is listed as a California species of concern. There is no management direction for the California horned lark in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The California horned lark is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Yellow Warbler (*Dendroica petechia*)

Species Ecology

The yellow warbler (*Dendroica petechia*) breeds from the coast range in Del Norte County, east to Modoc plateau, south along coast range to Santa Barbara and Ventura counties and along the western slope of Sierra Nevada south to Kern county. It also breeds along the eastern side of California from the Lake Tahoe area south through Inyo County, in several southern California mountain ranges, and throughout most of San Diego county (DFG 2006h). The yellow warbler winters in the Imperial and Colorado river valleys. It breeds in riparian woodlands (cottonwoods, willows, alders, and other small trees and shrubs typical of low, open-canopy riparian woodland), montane chaparral, and in open ponderosa pine and mixed conifer habitats with substantial amounts of brush from coastal and desert lowlands up to 8,000 feet (2,500 meters) in Sierra Nevada (DFG 2006h). Territories often include tall trees for singing and foraging and a heavy brush understory for nesting. Open cup nests are constructed in deciduous saplings and shrubs (Ficken and Ficken 1966). The yellow warbler breeds from mid-April into early August, with most activity occurring in June. Clutch size is typically four or five eggs, but ranges from three to six. Eggs are incubated for 11 days and young fledge at 9 to 12 days (Harrison 1978). Young breed the following year (DFG 2006h). The yellow warbler eats mostly insects and spiders. It gleans and hovers in the upper canopy of deciduous trees and shrubs, and occasionally hawks insects from the air, or eats berries (Bent 1953, Ehrlich et al. 1988). Numbers of breeding pairs have declined dramatically in recent decades in many lowland areas (southern coast, Colorado River, San Joaquin, and Sacramento valleys) (McCaskie et al. 1979, Garrett and Dunn 1981).

Status in Project Area

Suitable habitat for the yellow warbler is present at Lake Davis and in the project vicinity. The yellow warbler has not been observed at Lake Davis. It has been documented nesting at Red Clover Creek, approximately 1.5 miles north of Lake Davis in the Red Clover Valley,

during monitoring studies from 1988 to 1991 for the Red Clover Creek Demonstration Project (DWR 1993).

Management Direction

The yellow warbler is listed as a California species of concern. There is no management direction for the yellow warbler in the PNF LRMP or the SNFPA ROD. The management goal for California species of special concern is to maintain viable populations by halting or reversing population declines. The yellow warbler is protected under the Migratory Bird Treaty Act (16 USC § 703-711).

Pallid Bat (*Antrozous pallidus*)

Species Ecology

In California, the pallid bat (*Antrozous pallidus*) occurs within a variety of habitat types including grasslands, shrublands, woodlands, and coniferous forests (Philpott 1997). It is most commonly found up to 6,000 feet (1,830 meters) in elevation but has been recorded up to 10,000 feet (3,048 meters) in the Sierra Nevada Range (USFS 2001). Pallid bats are most common in open, dry habitats that contain rocky areas for roosting. Day roosts may vary but the bat is commonly found in rock crevices, tree hollows, mines, caves, and at a variety of human-made structures, including bridges (DFG 2006h). Tree roosting has been documented in larger conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks. Pallid bats are very sensitive to roost-site disturbance (Zeiner et al. 1990b; Philpott 1997). Night roosts are usually in more open sites and may include open buildings, porches, mines, caves and under bridges (Philpott 1997). Pallid bats mate from late October through February, although fertilization is delayed. Gestation lasts 53 to 71 days and young are born from April through July, mostly in May and June. Young are weaned after 7 weeks and have been observed flying in July and August (DFG 2006h). Pallid bats are insectivorous and feed primarily on ground-dwelling arthropods, although they can take aerial prey (DFG 2006h). They foraging over open ground, flying relatively low. Prey species include crickets, beetles, grasshoppers, moths, cicadas, centipedes, and scorpions. These bats forage usually within 0.25 mile of their roost sites and have night roosts close to or within their feeding area.

Status in Project Area

The pallid bat has the potential to occur throughout the PNF, especially in areas in close proximity to suitable roosting habitat. No project-specific surveys for the pallid bat have been conducted; however, pallid bats were recorded foraging during various bat surveys conducted in and adjacent to the project area from 1991 through 2002 (USFS 2006a).

Management Direction

The pallid bat is listed as a USFS sensitive species and a California species of concern. No specific management guidelines for the pallid bat are provided in the SNFPA ROD or the

PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Species Ecology

In California, the Townsend's big-eared bat (*Corynorhinus townsendii*) is typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 feet (3,292 meters) elevation (Philpott 1997). Habitat associations include desert, native prairies, coniferous forest, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas, and coastal habitat types (Kunz and Martin 1990) and prefers mesic habitats (Philpott 1997). This species roosts within caves, abandoned mines, tunnels, and some buildings (DFG 2006h). Distribution of this species is strongly correlated with the availability of roost sites. Townsend's big-eared bats form maternity colonies of up to several hundred females. These colonies show a high degree of roost-site fidelity, and, if undisturbed, colonies may occupy the same roost indefinitely (USFS 2001). This species is, however, highly sensitive to disturbance of roosts. Night roosts may occur in more open settings, including under bridges (Philpott 1997). Individuals are very loyal to their natal sites, and usually do not move more than 10 kilometers from a roost site (Pierson et al. 1991). Mating occurs from November through February and sperm is stored until spring when the females ovulate. Gestation lasts 56 to 100 days and young are born in May and June. Young are weaned after 6 weeks, and can fly 2.5 to 3 weeks after birth (DFG 2006h). This bat forages on flying insects, specializing in moths. It usually captures prey in flight, or by gleaning from foliage of brush or trees (DFG 2006h), often near water.

Status in Project Area

The Townsend's big-eared bat has the potential to occur throughout the PNF, especially in areas in close proximity to suitable roosting habitat. No project-specific surveys for the Townsend's big-eared bat have been conducted; however, Townsend's big-eared bats were recorded during various bat surveys conducted in the PNF in 1991-1992 and 2001-2002. None were detected in the project area (USFS 2006a).

Management Direction

The Townsend's big-eared bat is listed as a USFS sensitive species and a California species of concern. No specific management guidelines for the Townsend's big-eared bat are provided in the SNFPA ROD or the PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Spotted Bat (*Euderma maculatum*)

Species Ecology

The spotted bat (*Euderma maculatum*) is generally considered rare and little is known about this species in California. The spotted bat has been found in foothills, mountains, and desert regions of southern California (Watkins 1977) and in the Sierra Nevada. This species is found in habitats ranging from arid deserts and grasslands to mixed conifer forests up to an elevation of 10,600 feet elevation (3,230 meters). The preferred roosting sites of the spotted bat are rock crevices on steep cliffs, but they are occasionally found roosting in caves and buildings (DFG 2006h). Spotted bats mate in autumn and most births occur before mid-June. Only one young is produced annually (DFG 2006h). Moths are the dominant prey items. Spotted bats feed in flight, over water, and near the ground, using echolocation to find prey (DFG 2006h). Threats may include dam construction that would inundate high cliffs and canyon walls, human collection, and pesticides accumulated through diet (Hallet et al. 1998).

Status in Project Area

Suitable foraging habitat for the spotted bat is present in the project area. No project-specific surveys for the spotted bat have been conducted. This species was recorded during various bat surveys conducted in the PNF in 1991-1992 and 2001-2002.

Management Direction

The spotted bat is listed as a California species of concern. There is no management direction provided for the spotted bat in the PNF LRMP or the SNFPA ROD. The management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines.

Western Red Bat (*Lasiurus blossevillii*)

Species Ecology

The western red bat (*Lasiurus blossevillii*) in California is locally common west of the Sierra-Cascade crest, from Shasta south to Mexico (DFG 2006h). Western red bats roost in forest and woodland habitats, and forage over grasslands, shrublands, open woodlands, forests, and croplands (DFG 2006h). It is a solitary roosting bat, roosting primarily in deciduous trees and less often in shrubs. Roosts are often in edge habitats adjacent to streams, fields, or urban areas. They are dependent on riparian, riparian edge, and mosaic habitats (DFG 2006h). Breeding occurs in August and September; an 80- to 90-day gestation period follows delayed fertilization. Western red bats are born from late May through July (DFG 2006h). The diet of the western red bat consists of insects such as moths, crickets, beetles, and cicadas (DFG 2006h).

Status in Project Area

No project-specific surveys for the western red bat have been conducted; however, western red bats were recorded during various bat surveys conducted in the PNF in 1991-1992 and 2001-2002. None were detected in the project area. Red bats were found about two miles away from the project area during surveys conducted in 2001.

Management Direction

The western red bat is listed as a USFS sensitive species. No specific management guidelines for the western red bat are provided in the SNFPA ROD or the PNF LRMP. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species.

Sierra Nevada Snowshoe Hare (*Lepus americanus tahoensis*)

Species Ecology

The Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*) is an uncommon resident in the Cascade Range south through the Sierra Nevada to Mariposa, Mono, and Madera counties (DFG 2006h). It is found at high elevations in montane riparian habitat that consists of alder and willow thickets, young conifer stands, and patches of chaparral. Early seral stages of conifer, red fir, Jeffrey Pine or lodgepole pine, and aspen may also be used, primarily along edges, and especially near meadows (Orr 1940; Ingles 1965) Snowshoe hares breed from mid-February to June or July. Gestation lasts 35 to 37 days. The average litter produces three young, although litters may range from one to seven. Females may produce two to three litters per year. Snowshoe hares breed in their second year (Asdell 1964). Snowshoe hares are grazers and browsers, feeding upon grasses, forbs, sedges, and shrubs in summer, and conifer needles and bark, and willow and alder leaves and twigs in winter (Wolff 1980).

Status in Project Area

Surveys for the Sierra Nevada snowshoe hare have not been conducted in the project area; however, there have been incidental observations of the species in the Lake Davis area (Joel Schultz, pers. comm. 2006). The CNDDB records a female snowshoe hare collected near Yuba Pass in 1924, about 20 miles south of Lake Davis.

Management Direction

The snowshoe hare is listed as a California species of concern. There is no management direction given in the PNF LRMP or SNFPA ROD for the Sierra Nevada snowshoe hare. The management goal for California Species of Concern is to maintain viable populations by halting or reversing population declines.

Sierra Nevada Red Fox (*Vulpes vulpes necator*)

Species Ecology

The Sierra Nevada red fox (*Vulpes vulpes necator*) occurs in the Cascades and Sierra Nevada ranges, in Siskiyou County and from Lassen County south to Tulare County (DFG 2006h). Sierra Nevada red fox habitat varies between alpine dwarf shrub, wet meadow, subalpine conifer, lodgepole pine, red fir, aspen, montane chaparral, montane riparian, mixed conifer, ponderosa pine, Jeffrey pine, east side pine, and montane hardwood-conifer (DFG 2006h). It is most often found in forested areas interspersed with riparian and meadow habitat, and brushy fields. This species occurs from 4,000 to 12,000 feet (1,219 to 3,658 meters) in elevation but most often from 5,000 to 7,000 feet (1,524 to 2,134 meters) (USFS 2001). Den sites generally occur in densely vegetated or rocky areas. Meadows, fell-fields, grasslands, wetlands, and open areas are used for hunting. Sierra Nevada red foxes prey on small- to medium-sized mammals and some birds. They may also eat insects, carrion, fruits, and earthworms (Scott 1955; Scott and Klimstra 1955; Maccarone and Montevecchi 1981). Population declines are attributed to grazing, trapping, logging, and recreational disturbance (DFG 2006h).

Status in Project Area

Suitable habitat for the Sierra Nevada red fox is present in the project area; however, no project-specific surveys have been conducted. Approximately 50 percent of the PNF has been systematically surveyed according to established protocols using track plates and camera stations. To date, there have been no Sierra Nevada red fox detections associated with these surveys. The most recent detections in California are around Lassen National Park and the Lassen National Forest (USFS 2006a). This species has been detected 10 to 15 miles from Lake Davis.

Management Direction

The Sierra Nevada red fox is listed as a California threatened species and a USFS sensitive species. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. The PNF LRMP instructs the PNF to maintain viability of state-listed species and states that surveys should be conducted and habitat protected to maintain the existing populations. Management direction for the Sierra Nevada red fox is not provided in the SNFPA ROD; however, forest-wide standards and guidelines are provided in the SNFPA FSEIS (USFS 2004a). Management direction for protecting the Sierra Nevada red fox includes:

- Conduct surveys prior to project implementation;
- Upon a detection (photograph, track plate, or siting verified by a wildlife biologist) within five miles of the project area, perform an analysis to determine if the project has a potential to impact the Sierra Nevada red fox; and
- Restrict activities from January 1 to June 30 that are determined in the analysis to have an adverse impact.

California Wolverine (*Gulo gulo luteus*)

Species Ecology

The California wolverine (*Gulo gulo luteus*) is a resident of the North Coast Mountains of California and Sierra Nevada Mountains (DFG 2006h). Habitat tends to be mixed conifer, red fir, and lodgepole pine forests, although subalpine conifer, alpine dwarf shrub, wet meadow, and montane riparian habitats may also be used (White and Barrett 1979; Zeiner et al. 1990b). The elevation range of the wolverine is 4,300 to 7,300 feet (1,300 to 2,300 meters) in the Sierra Nevada region (DFG 2006h). Habitat components such as adequate year-round food supplies within large expanses of sparsely inhabited wilderness areas are more important than particular types of topography or plant associations (Ruggerio et al. 1994). White and Barrett (1979) stated that wolverines are highly dependent upon mature conifer forests for survival in winter, and generally move downslope in winter into heavier timber where more food is available. Cover is an important habitat requirement, as wolverines may be reluctant to cross openings, such as clear cuts, burned areas, and meadows (Hornocker and Hash 1981). Dens are constructed in caves, logs, cliff hollows, rock outcrops, burrows, and snow, and they sometimes use old beaver lodges (Thomas 1979). Mating occurs from May through July. Gestation lasts 30 to 40 days following delayed implantation and young are born from January through April (DFG 2006h). The young are weaned in seven to nine weeks. Wolverines breed in their second or third year. Not all females breed every year (Wright and Rausch 1955; Rausch and Pearson 1972; Hornocker and Hash 1981). Wolverines are opportunistic carnivores in the summer and primarily scavengers in the winter (Ruggerio et al. 1994). Large mammal carrion, commonly deer, is of vital importance to wolverines. Small prey items and berries are also consumed (DFG 2006h). Declines in wolverine populations are attributed to trapping, grazing, and human disturbance, although numbers now may be increasing (DFG 2006h). Management actions that decrease wild, isolated refugia or disrupt habitat use patterns within an individual's home range may be detrimental (USFS 2006).

Status in Project Area

It has been over 50 years since verifiable evidence regarding presence of wolverines in California has been collected (USFS 2001). The California wolverine has the potential to occur within the Beckwourth Ranger District; however, no project-specific surveys have been conducted. Approximately 50 percent of the PNF has been systematically surveyed to protocol using track plates and camera stations. To date, there has been no California wolverine detection associated with these surveys. The project area has been surveyed to established protocol (Zielinski and Kucera 1995) several times over the years using both camera stations and track plates, including survey efforts by USFS crews in 1994, and contracted surveys in 2002, 2004, and 2005. No California wolverines have been detected in the project area using these methods (USFS 2006a). The closest incidental/nonverified sightings occurred in 1989, 1990, 1993, and 1998 within or adjacent to the Lakes Basin Recreation Area, which is approximately 5 to 15 miles from the proposed project area.

Management Direction

The California wolverine is listed as a California threatened species and a USFS sensitive species. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. The PNF LRMP instructs the PNF to maintain viability of state-listed species and states that surveys should be conducted and habitat protected to maintain the existing populations. Management direction for the California wolverine is not provided in the SNFPA ROD. General project-related resource protection measures for the California wolverine described in the SNFPA FSEIS (USFS 2004) include:

- Conduct surveys prior to project implementation;
- Upon detection (photograph, track plate, or siting verified by a wildlife biologist) within five miles of the project area, perform an analysis to determine if the project has a potential to impact wolverines; and
- Restrict activities from January 1 to June 30 that are determined in the analysis to have an adverse impact.

American Marten (*Martes americana*)

Species Ecology

The American marten (*Martes americana*) is a permanent resident in California of the Sierra Nevada, Klamath, and Cascade mountains (DFG 2006h). In the Sierra Nevada Range, the marten is most often found above 7,200 feet elevation (2,195 meters), but it occurs at an elevation range from 5,500 to 10,000 feet elevation (1,676 to 3,048 meters) (USFS 2001). Suitable habitat consists of mixed evergreen forest of lodgepole pine, Jeffrey pine, or red fir (Clark et al. 1987). The American marten prefers large blocks of dense (50 to 100 percent canopy cover, multi-storied, multi-species, late-seral stage coniferous forest with a high number of large (greater than 24 inch dbh) snags and downed logs (Freel 1991). These areas are generally in close proximity to both dense riparian corridors (used as travelways) and an interspersion of small (less than 1 acre) openings with good ground cover (used for foraging). In the Sierra Nevada Range, martens were shown to prefer lodgepole pine in riparian settings (Ruggerio et al. 1994). Large trees, snags, fallen logs, large woody debris, and rock crevices or caves are used for foraging, dens, and general cover. Nests are located in cavities and are lined with leaves, grass, mosses, or other vegetation (Zeiner et al. 1990b). American martens breed in the summer and have a 220- to 290-day gestation period, including delayed implantation (Maser et al. 1981). The young are born in March and April and stay with the female until fall (DFG 2006h). The preferred food items of the American marten are small mammals, although it may take birds, fruits, insects, and fish. Marten prey items vary seasonally: bird eggs and nestlings, insects, fish, and mammals are preferred in summer; berries and other fruits are important in the fall; and in the winter, voles, mice, snowshoe hares, and squirrels dominate the diet (Ruggerio et al. 1994). Habitat loss and fragmentation, and human disturbance present the greatest threat to the American marten (DFG 2006h).

Status in Project Area

The American marten has the potential to occur within the Beckwourth Ranger District. There are over 40 records of marten observations/detections on the PNF dating back to 1975. Approximately 50 percent of the PNF have been systematically surveyed to protocol using track plates and camera stations. All verified American marten detections associated with these surveys occurred in the Lakes Basin-Haskell Peak area or around Little Grass Valley Reservoir. The Lake Davis area has been surveyed to established protocol (Zielinski and Kucera 1995) several times over the years using both camera stations and track plates, including survey efforts by USFS crews in 1994 and contracted surveys in 2002, 2004, and 2005. No American martens have been detected in the project vicinity using these methods (USFS 2006a). Surveys conducted since the early 1990s show the closest verified sighting to be within the Lakes Basin Recreation Area approximately 10 air miles from the proposed project area.

Management Direction

The American marten is listed as a USFS sensitive species. Management direction for the American marten is provided in the SNFPA ROD and the PNF LRMP. However, no specific guidelines are given for this type of project. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. General project-related resource protection measures for the American marten described in the SNFPA FSEIS (USFS 2004) include:

- Conduct surveys prior to project implementation; and
- If a marten birthing and kit rearing den is located, a protection buffer consisting of 100 acres of the highest quality habitat in compact arrangement surrounding the den site would be employed from May 1 through July 31.

Pacific Fisher (*Martes pennanti pacifica*)

Species Ecology

The Pacific fisher (*Martes pennanti pacifica*) most often occurs at elevations from 2,000 to 5,000 feet (610 to 1,524 meters) in the California north coast region, and from 4,000 to 8,000 feet elevation (1,220 to 2,440 meters) in the southern Sierra Nevada (Freel 1991). The fisher prefers large blocks of dense (60 to 100 percent canopy cover) multi-storied, multi-species, late-seral stage coniferous forests with a high number of large (greater than 30 inch dbh) snags and downed logs along with a hardwood component. Preferred habitat includes an interspersion of small (less than two acres) openings with good ground cover used for foraging. Also important is proximity to dense riparian corridors and topographic saddles between major drainages or other landscape linkage patterns used as adult and juvenile dispersal corridors. Forest type is probably not as important to fishers as the vegetative and structural aspects. Fishers may select forests that have low and closed canopies (USFS 2006a). The fisher dens in a variety of protected cavities, brush piles, logs, or under an upturned tree. Hollow logs, trees, and snags are especially important (Zeiner et al. 1990b). Females breed a few days after giving birth. Following delayed implantation, the gestation

period lasts approximately 30 days (Powell 1981b). The young are born February through May and remain with the female until late autumn. Fishers begin breeding in their first or second year (Powell 1982). Voles, snowshoe hares, and porcupines are favored prey species. The fisher will also feed on squirrels, mice, and chipmunks, carrion, fruits, and plants (Powell 1981a). Trapping has been identified as a potential risk factor for this species. Although fishers cannot be legally trapped in California, they are sometimes captured incidentally in traps set for legal species. Habitat fragmentation has contributed to the decline of fisher populations because they have limited dispersal distances and are reluctant to cross open areas to re-colonize historical habitat.

Status in Project Area

The Pacific fisher has the potential to occur within the Beckwourth Ranger District; however, no project-specific surveys have been conducted. The project area has been surveyed to established protocol (Zielinski and Kucera 1995) several times over the years using both camera stations and track plates, including survey efforts by USFS crews in 1994 and contracted surveys in 2002, 2004, and 2005. No Pacific fishers have been detected in the project area using these methods. Approximately 50 percent of the PNF has been systematically surveyed to protocol using track plates and camera stations. To date, there have been no Pacific fisher detections associated with these surveys in the project area (USFS 2006a). The closest verified sighting was within the Lakes Basin Recreation Area approximately 10 air miles from the proposed project area.

Management Direction

The Pacific fisher is a candidate for Federal listing, a California species of concern, and a USFS sensitive species. Management direction for the Pacific fisher is provided in the SNFPA ROD and the PNF LRMP. However, no specific guidelines are given for this type of project. The USFS is directed under the National Forest Management Act to maintain viable populations of designated sensitive species. General project-related resource protection measures for the Pacific fisher described in the SNFPA FSEIS (USFS 2004) include:

- Conduct surveys prior to project implementation; and
- If a fisher birthing and kit rearing den is located, a protection buffer consisting of 700 acres of the highest quality habitat in compact arrangement surrounding the den site would be employed from March 1 through June 30.

Mule Deer (*Odocoileus hemionus*)

Species Ecology

The mule deer (*Odocoileus hermionus*) is a common to abundant resident or elevational migrant found throughout California, except in deserts and intensively farmed areas that lack cover (Longhurst et al. 1952; Ingles 1965). Intermediate and early succession seral stages of forest, woodland, or brush habitat are used by mule deer. Preferred habitat has a mix of woody cover, meadow, shrubby patches, and water (DFG 2006h). Moderately dense

shrublands and forests are important for fawning. The rutting season occurs in autumn. Gestation lasts 195 to 212 days and fawns are born from early April to midsummer. Mule deer are sexually mature at 1.5 years (Taylor 1956; Wallmo 1981; Anderson and Wallmo 1984). Mule deer prefer to browse and graze on new growth of shrubs, forbs, and some grasses (Wallmo 1978, 1981), although mature plants, mushrooms, and acorns are also included in their diet (DFG 2006h). Fluctuations in populations are common. Habitat loss or fragmentation can cause declines in population numbers. California mule deer and black-tailed deer are the most abundant subspecies of mule deer found in California (DFG 2006h).

Status in Project Area

The entire Lake Davis shoreline and surrounding forest constitutes deer summer range. The Doyle deer herd, which uses the area around the reservoir, was estimated at 1,470 deer in 2005 (DFG 2005a). Areas on Crocker Mountain and in the watershed below Lake Davis are designated as important deer habitat (Plumas County 1987). Mule deer in the Doyle herd generally breed from November to early January, with gestation periods lasting between 183 and 218 days (Chappell 1988). Fawning grounds are located adjacent to and southwest of Big Grizzly Creek and an area just south of Lake Davis in Grizzly Valley (Chappell 1988). The southern, eastern, and northern margins of Lake Davis are designated as important seasonal deer migration routes in the Plumas County General Plan (1987).

According to the California Selected Mammal Hunting Regulations (DFG 2005b), the project area is within hunting zones X-6a and X-6b. The hunting season begins the first Saturday in October and continues for sixteen consecutive days. In 2005, all 380 of the available deer tags in zone X-6a were issued to deer hunters. Seventy-one bucks were reported as taken with hunter success at 18.7 percent. The estimated total number for killed bucks (including unreported harvest) was 98 killed with hunter success at 25.8 percent. The maximum number of deer tags was also issued in Zone X-6b in 2005. Eighty-one bucks were reported killed with hunter success at 19.1 percent. Estimates of actual kills were 85 bucks with success at 20.0 percent (DFG 2005c). Approximately 150 hunters visit Lake Davis during the month of October (DFG unpublished data). Hunting is not allowed within the Smith Peak State Game Refuge, which includes the forest surrounding the south and west sides of Lake Davis, and west of Big Grizzly Creek from Grizzly Valley Dam downstream to State Highway 70.

Management Direction

The mule deer is a USFS management indicator species. Management direction for the mule deer is not provided in the SNFPA ROD. The PNF LRMP instructs the PNF to coordinate with the DFG regarding the management of all game species, and to maintain and protect mule deer habitat.

7.2.1.5 Migratory Birds

Migratory birds are birds that breed in North America and migrate outside of the continental U.S. during the nonbreeding season. The Migratory Bird Treaty Act (16 U.S.C. §703-712, as amended) implements various treaties and conventions between the U.S. and other countries for the protection of migratory birds. Under this act, the taking, killing, or possessing of

migratory birds, including nests and eggs, is unlawful. Most bird species are protected under the Migratory Bird Treaty Act. In 2001, Executive Order 13186 (66 FR 3853-3856) was issued to outline responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act. The executive order directs federal agencies to promote the conservation of migratory bird populations. The USFS and USFWS entered into an interim memorandum of understanding having the purpose of strengthening migratory bird conservation through enhanced collaboration between the two agencies, in coordination with state, tribal, and local governments. Forty land bird species of particular concern to the USFS's Pacific Southwest Regional Forester's office have been identified. The USFS, through the SNFPA, recognizes four priority habitats for migratory bird conservation in the Sierra Nevada bioregion: montane meadow, non-meadow riparian habitat, late succession/old growth forest, and oak woodlands. Forest Service management direction for migratory birds is not specific to individual bird species but is to provide a diversity of habitats. Management is generally focused on habitat and overall population trends rather than individuals.

Most of the 170 plus bird species potentially occurring in the Lake Davis area are included under the protection of the Migratory Bird Treaty Act. The reservoir and surrounding area provide stopover habitat during migration as well as nesting habitat for many species of waterfowl and neotropical migrants. Neotropical migrant breeding bird species diversity and concentration of nesting is generally associated with the lush riparian vegetation found along perennial streams. Priority migratory bird conservation habitats in the project area include montane meadow and non-meadow riparian habitats. USFS priority species representing these habitats include the great gray owl and willow flycatcher.

7.2.1.6 Regulatory Environment

The regulatory environment for terrestrial wildlife is the same as the aquatic regulatory environment stated in Section 7.1.1.7 with the exceptions stated below which only apply to terrestrial wildlife:

Federal

Migratory Bird Treaty Act (16 USC §703-711; 50 CFR Subchapter B)

This law includes provisions for protection of migratory birds, including basic prohibitions against any taking not authorized by Federal regulation. The administering agency is the USFWS.

Bald and Golden Eagles Protection Act (16 USC §668; 50 CFR Part 22)

This law includes provisions for protection of the bald eagle and the golden eagle by prohibiting, except under certain specified circumstances, the taking, possession, and commerce of these birds. The administrating agency is the USFWS.

Sierra Nevada Forest Plan Amendment FSEIS/ROD

The 2004 SNFPA FSEIS and ROD (USFS 2004a) includes standards and guidelines for specific species including California spotted owl, northern goshawk, great gray owl, forest

carnivores, willow flycatcher, and amphibians. It also established a network of land allocations for 11 national forests in the Sierra Nevada and Modoc Plateau, including the PNF. Lands in each type of allocation are to be managed in accordance with specified standards and guideline. The ROD also described desired conditions for each type of land allocation. Fuels objectives are embodied in the standards and guidelines and desired conditions for each land allocation.

Draft National Bald Eagle Management Guidelines

The national Bald Eagle Management Guidelines would apply to bald eagles in the event the species is no longer listed as threatened under the ESA. If delisted under ESA, bald eagles remain protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Therefore, certain human-caused impacts to bald eagles would still be prohibited by agency policy.

State

California Fish and Game Code §3503

This law prohibits take, possession, or needless destruction of any bird egg or nest, except as otherwise provided by the Fish and Game Code or regulation made pursuant thereto. The administering agency is the DFG.

California Fish and Game Code §3503.5

This law prohibits take, possession, or destruction of any bird of prey (birds in the order of Falconiformes or Strigiformes), except as otherwise provided by the Fish and Game Code or regulation adopted pursuant thereto. The administering agency is the DFG.

California Fish and Game Code §3511, 4700, and 5050

These laws prohibit take or possession of birds, mammals, and reptiles listed as “fully protected,” except as provided by the Fish and Game Code. The administering agency is the DFG.

Natural Community Conservation Planning Act (California Fish and Game Code §2800 to 2835)

This law provides for the development of Natural Community Conservation Plans (NCCP) to provide for regional or area-wide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. The administering agency is the DFG.

Local

Lake Davis Bald Eagle Habitat Management Area Plan, 2004

The purpose of the Lake Davis Bald Eagle Habitat Management Area Plan is to develop a management strategy for the Lake Davis Bald Eagle Habitat Management Area that will provide sufficient suitable nesting and foraging habitat for bald eagles for the next 25 to 50 years.

7.2.2 Environmental Impacts and Consequences

This section analyzes the project's potential impacts to terrestrial wildlife resources. Both direct impacts associated with project implementation and indirect impacts to wildlife species that may occur off-site or later in time are addressed.

7.2.2.1 Evaluation Criteria and Environmental Concerns

Project evaluation criteria and the mandatory findings of significance as explained in CEQA, Pub. Res. Code sec. 21083; guidelines sec. 15065, indicate that a project will have a significant effect on biological resources if it will:

- Substantially degrade environmental quality;
- Substantially reduce fish or wildlife habitat;
- Cause a fish or wildlife habitat to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community; or
- Substantially reduce the numbers or range of a rare, threatened or endangered species

Additional thresholds of significance for biological resources under CEQA have been used in the following evaluation. Impacts were considered significant if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or by the US Fish and Wildlife Service or by the USFS.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or by the US Fish and Wildlife Service or by the USFS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

The application of these evaluation criteria and the concerns expressed by the public during project scoping used to identify environmental issues and impacts on terrestrial wildlife resources from the Proposed Project or alternatives. These issues are:

Exposure of terrestrial wildlife to rotenone through direct contact, ingestion of treated water, or consumption of fish killed by rotenone.

The application of rotenone to Lake Davis and its tributaries would potentially expose terrestrial wildlife to rotenone and other chemicals associated with the application and neutralization process through direct body contact, ingestion of treated water, and consumption of fish that were killed by rotenone.

Impacts associated with the drawdown of Lake Davis and the resulting reduction of aquatic and wetland habitats as used by terrestrial wildlife.

Drawdown of Lake Davis water levels would alter the distribution and quantity of aquatic and wetland habitats that are used by terrestrial wildlife species for drinking, foraging, nesting, and cover.

Impacts to fish-eating terrestrial wildlife due to the temporary reduction of the fish community through treatment of Lake Davis and its tributaries with rotenone and/or water drawdown.

Treatment of Lake Davis with rotenone is intended to kill all pike within the reservoir and as a result, would eliminate or drastically reduce populations of other fish species. Fish in Lake Davis constitute an important prey base for several locally occurring wildlife species. Some predators of fish generally prey upon larger fish, regardless of species, while other predators will prey upon fish of various sizes. Potential impacts to terrestrial fish predators may continue following renovation of the reservoir until pre-treatment fish densities and size-class distributions are reestablished.

Impacts to insectivorous terrestrial wildlife due to the temporary reduction of the aquatic invertebrate community through treatment of Lake Davis and its tributaries with rotenone and/or water drawdown.

Many species of aquatic invertebrates present at Lake Davis are preyed upon by terrestrial wildlife that forages in and around the water. The adult stages of many aquatic insect species emerge from the water and are also available as prey to wildlife. Rotenone is especially toxic to gill-breathing aquatic invertebrates, and the resulting reduction in this prey base may impact various terrestrial wildlife species.

Impacts to terrestrial wildlife due to disturbance associated with treatment and/or water drawdown activities at Lake Davis and its tributaries.

Successful treatment of Lake Davis would require large quantities of equipment and supplies, including vehicles and boats, and the presence of many people. Staging areas would be established where many of the project-related activities would be concentrated. In addition, rotenone treatment activities would involve the entire surface area of the reservoir as well as approximately 34 miles of the associated tributaries and at spring sites. Treatment of the reservoir would be treated primarily from boats. The tributaries and springs would be treated with rotenone by personnel accessing these sites by foot. In addition, pumps, pipelines, cofferdams, and removal of some vegetation may be necessary to facilitate treatment of tributaries and springs.

7.2.2.2 Evaluation Methods and Assumptions

Numerous sources were used to gather existing information on terrestrial wildlife resources in the project area, including the PNF LRMP (USFS 1988) and SNFPA (USFS 2001), environmental documents and survey results prepared for recent and planned projects on the Beckwourth Ranger District (e.g., DFG 1997; USFS 2005, 2006a), and unpublished data from the PNF and DFG. Lists of special status species potentially occurring in the project area were obtained from the USFWS, CalFed, the PNF sensitive species and indicator species lists, and a review of records from the California Natural Diversity Database as described in Section 7.2.1.4 Special Status Species of Terrestrial Wildlife. These data were used to establish the environmental setting. The resources described in the environmental setting were evaluated to determine the potential impacts of activities associated with the Proposed Project and alternatives and to develop mitigation measures, as appropriate.

The impacts of the Proposed Project and Alternatives A through E were evaluated based on the following assumptions:

- Impacts to terrestrial wildlife resources could result from habitat changes associated with reservoir drawdown, disturbance during treatment, and reductions in aquatic insect and fish communities as preyed upon by terrestrial wildlife;
- The Proposed Project would be implemented no earlier than August 15; and
- The Proposed Project and its alternatives will comply with the PNF LRMP (USFS 1988), as amended by the SNFPA (USFS 2001).

7.2.2.3 No Project/No Action

Under the No Project alternative, eradication of northern pike from Lake Davis would not occur. This would likely lead to the continued expansion of the pike population in the reservoir and the probable escape of pike to downstream locations, resulting in severe consequences to the aquatic resources of the state, as described in Section 1.1.3. Pike are a highly piscivorous (i.e., fish-eating) predatory fish, and as pike population density would increase, the trout population, without supplemental stocking, would decrease. Pike may eventually become the dominant species in Lake Davis and may greatly reduce or even extirpate populations of most other fish species. As pike populations increase in tributary

streams, there may also be increased predation on amphibian populations over that caused by introduced trout. At some time in the future, a pike-dominated reservoir would possibly impact their own food base, resulting in a stunted population of small pike.

The No Project alternative may, at some time in the future, result in long-term changes to the Lake Davis fishery where there would be loss of fish species diversity and possibly a shift toward smaller-size fish. These changes could have ramifications to some species of fish-eating terrestrial wildlife at Lake Davis, such as the bald eagle and osprey. Nesting eagles and osprey depend on fish for successful rearing of their young. They take a variety of fish species, including pike, and tend to prey on medium- and large-size fish (generally about 10 inches total length and greater), capturing them from the water with their talons. Smaller fish are less likely to be captured.

Different species of fish each have different water temperature requirements and behavioral patterns. This influences fish distribution in the reservoir and the timing of when fish may be near the surface where they are vulnerable to predation by eagles and osprey. Increased fish species diversity could result in a more reliable source of fish for eagles and osprey throughout the year. Fewer species and smaller-sized fish present in the reservoir would decrease the overall availability of fish to eagles and osprey. Under current conditions at Lake Davis, bald eagle nesting success appears to be compromised when two pairs nest at the reservoir during the same year, suggesting that perhaps food resources may be limited. Therefore, any reduction in fish availability to nesting eagles compared with current conditions would likely contribute to lower nesting success.

The No Project alternative would ultimately result in adverse effects to bald eagles and osprey at Lake Davis. The availability of fish in Lake Davis as prey to eagles and osprey would progressively decrease through time as compared to current conditions, a significant and unavoidable adverse impact. Generally, when evaluating the potential environmental effects of a proposed action, current conditions as defined without project implementation form the basis of the analysis under CEQA (and the determination of significance). However, in the case of the Lake Davis Pike Eradication Project, there are environmental consequences related to the No Project alternative, and so it represents a parallel environmental baseline.

7.2.2.4 Proposed Project/Proposed Action – 15,000 Acre-Feet (Plus Treatment)

Exposure of terrestrial wildlife to rotenone through direct contact, ingestion of treated water, or consumption of fish killed by rotenone.

A detailed discussion of the toxicity of rotenone to wildlife species is provided in Appendix J. In summary, rotenone kills living organisms by inhibiting a biochemical process at the cellular level, making it impossible for the organism to use the oxygen absorbed into the blood (Finlayson et al. 2000). Treatment concentrations of up to 2 mg/L (2 ppm) formulated rotenone mixed into water is anticipated to remain toxic long enough to kill most gill-breathing organisms such as fish, some forms of amphibians, and aquatic invertebrates (Bradbury 1986; DFG 1994). All animals (including fish) have natural enzymes in the digestive tract that neutralize rotenone, and the gastrointestinal absorption of rotenone is

inefficient. Therefore, there is no bioaccumulation of rotenone in living organisms or through the food chain (Appendix J.3.2.1). Gill-breathing organisms are more susceptible to rotenone because rotenone is readily absorbed directly into their blood through their gills and thus, digestive enzymes cannot neutralize it (Bradbury 1986; Finlayson et al. 2000) (Appendix J.3.2).

Liquid formulations of rotenone (i.e., Noxfish®) contain dispersants and emulsifiers known as "inert ingredients." Finlayson et al. (2000) and the DFG (1994) conclude that inert ingredients have little, if any, effects on insects, fish, amphibians, reptiles, birds, or mammals in typical rotenone applications (up to 2 ppm). Based on this information, it is assumed that inert ingredients would not have added impacts to species beyond those expected for the active ingredient.

Mammals that live near waters treated with rotenone may ingest rotenone either by drinking treated water or by eating dead fish that were killed by the rotenone treatment. However, toxicity data for orally administered rotenone indicate that mammals would not be affected by drinking rotenone treated water or eating rotenone-killed fish (Bradbury 1986). The mammalian digestive system is not an efficient mode for rotenone entry into an animal's body, thus limiting potential for harm. Rotenone residues in dead fish are generally very low (< 0.1ppm), unstable, and not readily absorbed through the gut of an animal eating a rotenone-killed fish (Finlayson et al. 2000). As an example, in order for a small mammal weighing approximately 0.5 pound to be killed by rotenone, it would have to drink 33 gallons of reservoir water treated with a 2 ppm dosage (Bradbury 1986) (Appendix J.3.4.3.1).

Special status mammals potentially occurring in the project area may be exposed to rotenone by drinking treated water or eating killed fish. All mammals, from bats to carnivores to mule deer, break down rotenone in the digestive tract rendering short-term exposure virtually harmless. Therefore, mule deer that have ingested rotenone-treated water and are subsequently shot by hunters do not present a threat to humans through the consumption of deer meat.

Birds that live near water bodies treated with rotenone may ingest rotenone either by drinking treated water or eating aquatic invertebrates or fish killed by the rotenone treatment. However, as with mammals, toxicity data indicate that birds would not be affected by drinking treated water or consuming rotenone-killed organisms (Bradbury 1986). As an example, a bird weighing 0.25 pound would have to drink 25 gallons of treated water or eat more than 40 pounds of fish and invertebrates within 24 hours to receive a lethal dose (Finlayson et al. 2000) (Appendix J.3.4.3.2).

All birds in the vicinity of Lake Davis could potentially be exposed to rotenone through ingestion of treated water and/or direct bodily contact (especially loons, Canada geese, and other waterfowl). Special status species such as the bald eagle, osprey, and white pelican are also likely to be exposed to rotenone when they consume dead fish. However, the breakdown of rotenone by digestive enzymes renders its effects on all bird species as inconsequential and would not result in a measurable impact.

Toxicity data indicate that amphibians are more tolerant of rotenone than most fish species, nonetheless, rotenone is generally considered toxic to all gill-breathing life stages of amphibians. At concentrations of approximately 2 ppm, rotenone kills frog tadpoles,

salamander larvae, and gill-breathing adult salamanders (Bradbury 1986). Adult amphibians without gills are much less susceptible to rotenone than larvae. At concentrations of 2 ppm, the DFG (1994) concludes that rotenone treatment would have little effect on non-gill breathing amphibians. However, Maxell and Hokit (1999) conclude that adult turtles and frogs may suffer mortality from rotenone depending on the length of exposure (Appendix J, Sections J.3.4.3.4 and J.3.4.3.5).

Special status amphibians and reptiles that may occur in the vicinity of Lake Davis include the mountain yellow-legged frog, foothill yellow-legged frog, and northwestern pond turtle. Previous surveys for these species have not located any individuals within the project area or within the greater vicinity of Lake Davis. However, suitable habitat for these species occurs in the project area and these species are often difficult to locate. Repeated surveys are often necessary to document their absence. Pacific treefrogs and long-toed salamanders are known to occur in association with tributary streams that are planned for treatment with rotenone; neither species has a special status designation. Since all proposed applications of rotenone would be after August 15, larval forms of the frogs would likely not be present; however, at least some proportion of adult salamanders in the area retains gills and as such are highly susceptible to mortality from rotenone exposure. Adult frogs, terrestrial salamanders, and pond turtles are not as severely affected by rotenone and may escape toxic exposure if individuals occur away from treated areas in other wetland and terrestrial habitats (e.g., small seeps and boggy areas), by submerging into the mud, or by tolerance to rotenone. Sub-lethal exposure of these species to rotenone may have the short-term effect that, while under the influence of rotenone and resulting reduction in respiration, there may be an impaired ability to escape predators. The Pacific treefrog and salamanders are widespread in the project area and would be expected to disperse from non-treated areas and re-colonize into suitable habitat in treated streams following dissipation of the rotenone.

Impact Terrestrial Wildlife (TW)-1: The application of rotenone to habitats potentially occupied by mountain yellow-legged frog, foothill yellow-legged frog, and northwestern pond turtle may result in mortality to individuals. The adverse impact is significant but mitigable.

Mitigation TW-1: Due to the potential susceptibility of the mountain yellow-legged frog, foothill yellow-legged frog, and northwestern pond turtle to the effects of rotenone, additional surveys for these species are to be conducted in all areas of suitable habitat in tributary streams to Lake Davis that would be treated with rotenone. These surveys are to be conducted in accordance with standard protocols (DFG 2004c and DFG 2006g) during the same year of treatment and prior to the proposed application of rotenone. If any of these species are found within the proposed treatment area, a concerted effort will be made to capture as many individuals as possible beginning 2 weeks prior to treatment. These individuals would be transported and released in suitable habitat in the immediate project area that will not be treated with rotenone, or held for release where captured, following dissipation of the rotenone. Prior to transplantation of any animals to an adjacent waterbody, amphibians at both the source and donor sites will be tested for chytrid fungus (*Batrachochytrium dendrobatidis*). If animals from Lake Davis test positive, they will not be transplanted. If the proposed recipient site tests positive, alternate recipient sites should be screened until a site is found where chytrid fungus is absent. Decisions whether to hold

animals or where they are to be transplanted will be done in coordination with USFS and DFG biologists. The adverse impact is significant but mitigable.

Significance after Mitigation: Less than significant.

Impacts associated with the drawdown of Lake Davis and the resulting reduction of aquatic and wetland habitats used by terrestrial wildlife.

The proposed drawdown of Lake Davis prior to rotenone treatment would reduce the surface acreage of the reservoir while exposing areas that have been previously inundated. Lake Davis is currently being managed at a volume of approximately 45,000 acre-feet with a surface area of 2,838 acres. The Proposed Project would gradually reduce this volume to 15,000 acre-feet, or 1,331 surface acres at a surface elevation of 5,749 feet. This would result in a change in the surface area of the reservoir by 1,507 acres, reducing open water habitat by 53 percent of the reservoir's pre-drawdown size. At its lowest point, Lake Davis would have a surface area of just over 2 square miles and, at a surface elevation of 5,749 feet, the watered surface of Lake Davis would extend for almost 4.5 linear miles in distance, from the dam upstream to above Lightning Tree Point. Based on a review of past in-flow rates over the 38-year operational history of the reservoir, and discharging water from the reservoir at the maximum rate, the target drawdown level of 15,000 acre-feet would be reached by July 1 in 74 percent of the past years, and 90 percent of the time by August 1 (see Appendix D). The maximum discharge from the reservoir without using supplemental pumping is approximately 10,000 acre-feet per month.

The proposed drawdown will have a short-term beneficial effect for fish-eating terrestrial wildlife because fish would be concentrated into a smaller area and readily accessible. Special status species in the Lake Davis area that would benefit by increased prey density would include the bald eagle, osprey, white pelican (non-breeding), and common loon (non-breeding). The concentration of fish would increase from spring through late summer, making fish more available to bald eagles and osprey as nestlings gain in size and demand increasing quantities of food. In addition, when the young osprey and bald eagles fledge and are learning how to forage, fish would be more readily available.

The reduction in surface acres of the reservoir could limit access by bald eagles and osprey to the water during times of high boat use. However, high-density human use across the reservoir is expected to occur only during limited periods and the USFS is to issue a closure order excluding access by people to the previous inundation zone of the reservoir (to protect cultural resources). Any reduction in the time available to eagles or osprey for foraging at the reservoir during drawdown due to disturbances by people because of concentrated recreational activities would be offset due to the increased availability of fish in the reservoir.

Despite the concentration of fish in the receding pool that would facilitate foraging by eagles and osprey, a limited reservoir surface area could reduce foraging opportunities while adult birds are attending to dependant young. Lake Davis is the only waterbody in the region supporting two pairs of eagles, and the productivity data suggests that in most years at normal water levels there may be some loss of productivity at one eagle nest due to the presence of the other. It is unclear if this would be related to possible confrontation among territorial birds, limited foraging opportunities, or a limited prey base. At some point as the

reservoir surface area decreases, there would be added stress to foraging eagles and perhaps added competition with the four to six nesting pairs of osprey that may also be foraging in the more confined area of the drawn down reservoir.

When drawn down to 15,000 acre-feet, the reservoir is almost 4.5 miles long and about one mile wide at its widest point. Given the geographic extent of the reservoir and the increased density of fish, there should be suitable foraging opportunities for up to several eagles and ospreys at the reservoir during drawdown leading up to treatment. However, the rate of refill following treatment is dependent on inflow (i.e., precipitation in the watershed), and the probability that the reservoir would refill within a given timeframe are estimates based on inflow data from past years. There is a 48 percent probability that the reservoir would reach 45,000 acre-feet by June 1 of the year following treatment and a 76 percent chance that level would be reached by June 1 of the second year. While the reservoir is refilling, fish densities would be reduced and eagle foraging opportunities may be compromised until such time that reservoir volume and fish densities return to pre-treatment levels, especially if two nesting pairs of bald eagles would be present at the reservoir. See below, under "Impacts to fish-eating terrestrial wildlife due to the temporary reduction of fish community" regarding implementation of a supplemental bald eagle feeding program.

The drawdown of Lake Davis has the potential to impact Canada geese and other nesting waterfowl. Nests are placed in dense vegetation, often along the margins of water bodies. As the reservoir level decreases from winter through spring, there may be some reduction in suitable waterfowl nesting sites, resulting in the potential displacement of breeding birds from Lake Davis to other area reservoirs. In addition, receding water levels and drying of the ground could result in changes in vegetation structure and density at potential nest sites. If these changes occur over the approximately 30-day Canada goose incubation and nesting period, nests could be exposed making them more susceptible to predation. During the spring following treatment, water levels would be consistently rising as water is held to re-fill the reservoir. This may result in inundation of waterfowl nests that may be placed near the water's edge. These project effects would not be expected to impact all waterfowl nesting attempts at Lake Davis, and other lakes and wetlands throughout the region provide waterfowl-nesting habitat. White pelicans and waterfowl migrating through the area during the fall would encounter Lake Davis while it is at its lowest volume. At least some of these birds would likely be displaced to other area lakes or reservoirs (especially following rotenone treatment and loss of food base within the reservoir). Fewer waterfowl at Lake Davis may reduce the prey base of peregrine falcons potentially nesting in the general vicinity.

When the drawdown of Lake Davis reaches a surface elevation below approximately 5,760 feet (approximately 36,000 acre-feet of water storage; surface area of 2,480 acres), a land or shallow-water connection between the shore and the island in Lake Davis would be established. This island is used for nesting by a colony of California gulls and ring-billed gulls. There were approximately 150 nesting pairs of each species in spring 2006 (Joel Schultz, USFS, pers. comm. 2006). The California gull is a state species of concern, and often forms large nesting colonies on predator-free islands in inland lakes and reservoirs. The ring-billed gull is one of the most common inland gulls (Sibley 2000). With a major reduction or the loss of the separation between the island and shore, predators such as the

coyote can easily cross onto the island where nesting gulls and their chicks are highly vulnerable.

The California gull nesting period, from egg laying to fledging, ranges from 58 to 68 days. At Mono Lake, in Mono County, California, nests may be established in late April and egg laying begins at the end of April with the majority occurring in early to mid-May. Hatching begins in late May and is heavily concentrated in early to mid-June, though a very low percentage of nests may still contain eggs in early July (Hite et al. 2005; Nelson et al. 2006). The majority of chicks remain in the nest through mid-July, and there are very few active nests with chicks into early August. The loss of an entire colony of 511 nesting California gulls on a small islet at Mono Lake that occurred within a two-week period in 2004 has been attributed to coyotes that gained access to the islet (Hite et al. 2005).

The reservoir drawdown model assumes a continuous, maximum discharge rate from the reservoir and predicts the probability of a specific surface elevation based on the in-flow rates of past years. The model predicts a 61 percent probability that the surface elevation of 5,760 feet would be reached by June 1; a 74 percent probability by July 1; and a 90 percent probability by August 1 (see Appendix D). It is highly likely that lake levels will allow potential passage for predators to the island while chicks remain in the nest. Refill of Lake Davis following treatment is dependant on inflow from the tributaries. Based on past inflow data, there is a 48 percent probability that the reservoir would refill to the 5,760-foot elevation level by May 1 for the year following treatment; 75 percent probability by May 1 of the second year; and 82 percent probability by May 1 of the third year post-treatment. The island in Lake Davis has the only known nesting colony of California gulls in the Lake Davis area.

Prior to the formation of the shallow water crossing to the island due to the receding water, California gulls would have initiated nesting. As the land connection forms, the gulls would likely be tending to their chicks and therefore, they would not be expected to immediately abandon the island. To maintain a barrier between the island and shore of Lake Davis and deter access by mammalian predators, an appropriate fence (e.g., made of “hogwire” fencing material of a mesh size and height that would preclude coyotes from crossing) would be constructed across the emerging connection to the island and extend out into the water. The fence would be in place at the time of or before the shallow water crossing would form, at approximately a surface elevation of 5,760 feet. As the waters continue to recede, the fence may need to be extended to maintain the barrier across the widening connection to the island. The fence would be checked at least every third day, while the waters recede, to ensure that its integrity is maintained. The fence would be in place as long as gull chicks remain associated with their nests (approximately to August 1). In the year(s) following treatment, the fence would continue as a barrier to prevent mammalian predators from reaching the island until there is adequate water separation for the island (at or above approximately 5,760 feet surface elevation). However, depending on the rate of refill and the extent of the land connection to the island, the gulls may not perceive the island as a safe nesting location until the land connection is fully inundated. Therefore, if gulls do not nest by May 31 the fence would no longer be needed during that year. Reservoir refill to a level that would provide a water barrier around the island may occur prior to the first year post-treatment or under drought conditions it may take four or five years.

The drawdown of Lake Davis would dewater patches of riparian vegetation associated with the reservoir's shoreline and the lower segments of tributary streams. Generally, these are small patches of willow and other riparian shrubs. Some patches may be suitable as willow flycatcher or yellow warbler habitat, especially along the northern shores of the reservoir. These areas are, however, of lesser quality and extent than the riparian habitats found along tributary streams such as Freeman and Big Grizzly creeks where inflow continues into Lake Davis. At the head of the Big Grizzly Creek watershed, Summit Lake forms a shallow wetland and marshy area at an elevation of 5,840 feet, approximately 3.5 miles upstream from Lake Davis (Lake Davis spillway elevation is 5,775 feet). Greater sandhill cranes have been observed at Summit Lake, where they are possibly nesting. The wetland habitats at this location would not be impacted by the drawdown of Lake Davis.

The drawdown of Lake Davis would bring about an increase in the amount of open meadow-like habitat available for colonization by terrestrial vegetation, primarily annual grasses and forbs, and perhaps sedges in the wettest areas. Drying of areas that are normally inundated would expand suitable habitat conditions for various species of invertebrates, most notably grasshoppers and crickets, and small mammals, including mice, voles, and pocket gophers. These changes would result in minor increases in potential foraging areas for species that feed on grasses, forbs, or insects in meadows such as Canada goose, sandhill crane, white-faced ibis, California horned lark, Sierra Nevada snowshoe hare, and mule deer. Aerial predators such as Swainson's hawk, ferruginous hawk, golden eagle, northern harrier, prairie falcon, and great gray owl that hunt primarily rodents in meadows and other open areas may find increased foraging opportunities at Lake Davis during and after reservoir drawdown. However, a potential increase of 1,507 acres of foraging habitat, in comparison to other areas of higher quality habitat in the project vicinity, would have inconsequential impacts to these species due to the limited scale and duration. With lower reservoir volume, the shoreline is farther from hiding cover of forest or shrubs, potentially reducing safe access to drinking water by various wildlife species, including mule deer, black bear, and forest carnivores. Other sources of water remain in the area around Lake Davis.

Any potential change in foraging habitat and prey density for the California wolverine or Sierra Nevada red fox would also be considered inconsequential. Neither species is known to occur within the immediate project area though suitable habitat is present.

Impact TW-2: The drawdown of Lake Davis could result in altered habitats used by various terrestrial wildlife species, including a reduction in the surface area of the reservoir used as foraging habitat by the bald eagle and osprey, and increased predation and reduced habitat for nesting and migrating Canada geese and other waterfowl. The adverse impact is significant but mitigable.

Mitigation TW-2: See below, under "Impacts to fish-eating terrestrial wildlife due to the temporary reduction of fish community", Mitigation TW-4d, regarding implementation of a supplemental bald eagle feeding program.

Significance after Mitigation: Less than significant.

Impact TW-3: The drawdown of Lake Davis to the proposed water volume level could result in a land or shallow-water connection to the island in Lake Davis, that is used as

a colonial nesting site by California gulls. The loss of the separation between the island and shore prior to completion of the gulls nesting period could allow predators access to the island when nesting gulls and their chicks are highly vulnerable. Refill of the reservoir to a level that would provide a water barrier around the island may occur prior to the first year post-treatment, or it may take four or five years. The adverse impact is significant but mitigable.

Mitigation TW-3: To maintain a separation between the island and shore of Lake Davis and deter mammalian predators from accessing the breeding colony of California gulls, a fence, of appropriate height and mesh to exclude coyotes, will be constructed across the emerging low water connection to the island as the surface level of the reservoir reaches approximately 5,760 feet. The fence will be checked at least every third day while the waters recede to ensure that its integrity is maintained, and it will be extended as needed to reach into the water. The fence would be in place as long as gull chicks remain associated with their nests (approximately to August 1). In the year(s) following treatment, the fence would continue as a barrier to prevent mammalian predators from reaching the island until there is an adequate water separation for the island (at or above approximately 5,760 feet surface elevation). If gulls do not nest by May 31 the fence would no longer be needed during that year.

Significance after Mitigation: Less than significant.

Impacts to fish-eating terrestrial wildlife due to the temporary reduction of the fish community through treatment of Lake Davis and its tributaries with rotenone and/or water drawdown.

The intent of the rotenone treatment of Lake Davis is to eliminate northern pike from the reservoir. This would result in the loss of most fish to assure eradication of the pike and would effectively but temporarily eliminate the primary prey base for several special status species that occur at Lake Davis, including the bald eagle, osprey, common loon, and white pelican. The loon and pelican do not nest at Lake Davis. These birds often feed on small- and medium-size fish and, when faced with limited food resources, may disperse to other areas. Both the bald eagle and osprey, which generally feed on medium and larger size fish, nest in the Lake Davis area. Though eagles also take other prey such as waterfowl and rabbits, nesting eagles often depend on fish for successful rearing of young. Osprey are fish-eating specialists. Potential impacts from the project to these species at Lake Davis may continue following renovation of the reservoir until pre-treatment fish densities and size-class distributions are re-established.

The proposed rotenone treatment would occur near the end of, or after, the bald eagle breeding season. If treatment would occur after young bald eagles have fledged and left their nest territory (and possibly dispersed), the loss of the fish prey base would not compromise eagle reproductive success in the year of chemical treatment. However, treatment may occur as early as August 15 depending on when the reservoir is drawn down to the target volume (the warmer the water the more effective the rotenone treatment). Based on past in-flow records and proposed rate of drawdown, there is a 79 percent probability that the reservoir would reach target volume on or before September 1. Bald eagles would not be expected to abandon their young late in the breeding season when eaglets are about to or have recently

fledged. However, the loss of the prey base immediately after fledging while a young eagle is learning how to capture its own food could cause stress and possible impairment to the fledgling. The PNF Lake Davis Bald Eagle Habitat Management Area Plan (Schultz and Nickerson 2004) establishes that disturbances to nesting territories be restricted through August 31. Loss of the eagle's prey base while fledglings remain associated with their nest territory may be considered as a "disturbance."

Immediately following treatment, dead fish would be readily available to eagles, but these fish are to be gathered and removed from the reservoir. Some number of brown bullheads (*Ameiurus nebulosus*) are expected to survive the rotenone treatment and bald eagles frequently take them as prey (Jackman et al. 1999; Schultz and Nickerson 2004). However, the density of bullheads remaining in the reservoir immediately following treatment is not expected to be sufficient to sustain eagles at Lake Davis, especially while the fledglings are developing their foraging skills.

Bald eagles, being opportunistic foragers, are known to readily use supplied food in the absence of natural prey, and supplemental feeding programs for eagles have been used as mitigation for prey loss resulting from rotenone treatments at several lakes in Oregon (USFWS 2004b). Under certain circumstances, supplemental feeding at Lake Davis could mitigate the short-term loss of the fish prey base. If rotenone treatment occurs prior to September 1 and fledgling eagles are present at Lake Davis, a supplemental feeding program would be established whereby food is made available to the eagles until the time at which they would normally disperse. Dead fish (rotenone-killed fish may be used) are to be provided to eagles at two sites within or adjacent to each active nesting territory beginning before all dead fish are removed from the reservoir during cleanup. Several dead fish are to be placed early each morning on the ground near the shoreline or on an anchored raft floated on the water in view of a suitable eagle perch in the area where nesting or fledgling eagles have been active. Food would be provided every five out of seven days while skipping no more than one day in succession. Supplemental feeding would continue until at least September 1 and when all fledgling eagles are capable of dispersing from the area.

Eagles normally remain at Lake Davis into the fall and early winter, and some often stay through the winter months. These birds would likely include eagles that had nested at the reservoir the previous summer and migrants to the area. Eagle pairs would be expected to be on their territories by the January following chemical treatment and would likely attempt to nest as usual. During the winter following rotenone treatment, when the fish prey base is limited, these birds could be displaced to other area lakes, including to Frenchman Lake, which already supports an eagle nesting territory. Under normal circumstances, wintering bald eagles probably routinely forage at other area lakes until ice-off at Lake Davis in the spring. The potential temporary increase in competition for prey, and the potential interference with the resident eagles at Frenchman Lake while they are establishing their nesting territory, is not expected to result in disruption of nesting status. Eagles normally move around during winter in response to freezing of lakes, which limits access to their prey and may concentrate birds at available foraging sites. Eagle pairs are often on territory by January while the associated lake or reservoir is frozen over. These birds would then forage at other waterbodies or on alternate prey until ice-off in early spring.

The loss or major reduction of the available fish prey base at Lake Davis during the first spring and summer following treatment, when fish are normally abundant at the reservoir and eagles are feeding themselves and their young, represents the greatest potential adverse affect to eagles associated with the Proposed Project. Although eagles would not be expected to abandon their nests, lack of a fish prey base could compromise nesting success. As part of the Proposed Project, DFG would implement an aggressive trout re-stocking program following the Lake Davis Fisheries Management Plan (Appendix G). There would be an emphasis on large fish in order to quickly restore the eagle prey base at Lake Davis to pre-treatment fish densities quickly. The fisheries management goal for Lake Davis would be to develop and maintain a trout fishery, with a minimum average angler catch rate of 0.30 trout per hour and a trout length of 15 inches. Creel surveys (monitoring of fish catch rates) are used as an index to determine fish size and density at Lake Davis. When target catch rates (i.e., densities) are not met, additional stocking would be initiated. Trout would be stocked in the fall and spring after the eradication, followed by annual stocking of rainbow trout.

To monitor the fishery in Lake Davis, the DFG would conduct creel surveys at the reservoir to determine angling success. The surveys would be conducted approximately eight (8) days per month, consisting of 75 percent weekdays and 25 percent weekend/holidays. The surveys would begin in April and be conducted each month through October for a minimum of two years post-treatment. At the end of each survey season, the creel survey data would be summarized to determine the annual catch per hour (CPH) for trout. Generally, CPH is expected to be higher in April, May, September, and October of each year. The CPH typically drops through June and is often lowest in July and August due to warm water conditions. Fishery managers would use the annual CPH figures to make management decisions for the following year's trout stocking rates.

Elements of the DFG stocking program at Lake Davis would include:

- Immediately following eradication, once water is no longer toxic:
  - Trout will be catchable size or larger
  - Reservoir stocked at a rate of 5 fish per surface acre
- Spring following eradication:
  - Rainbow trout will be various sizes, including:
    - Fingerlings, 230 per surface acre
    - Sub-catchables, 50 per surface acre
    - Catchables, 30 per surface acre
    - Trophy (>3 lbs), 0.1 per surface acre
  - Brown trout adults will be stocked
    - Adults (≥3 lbs), 0.1 per surface acre
- Fingerling brook trout will be restocked in Freeman Creek and Cow Creek at an undetermined stocking rate.
- Long-term desired outcome:

  - 10-12 catchable size trout per surface acre
  - Maintain a catch rate of 0.25 trout per hour
  - Average total length of trout 15 inches
- Monitoring of Lake Davis post-eradication:
  - Creel surveys conducted 8 days/month (75 percent weekdays, 25 percent weekends/holidays), April through October, for a minimum of two years post-treatment
  - At end of the season annual catch per hour will be determined for trout
  - Catch per hour will determine stocking rates for the next year

Initial trout stocking rates take into account the reduced fish forage base within the reservoir following rotenone treatment, though the fish that are stocked would be a size suitable for eagle prey. As the phytoplankton and invertebrate fauna of the reservoir are reestablished, higher trout stocking rates would be applied. As the reservoir refills and productivity increases, stocked trout are expected to grow vigorously and maintain fish densities capable of supporting nesting bald eagles. During mid- to late summer when water temperatures rise, especially on the surface and in shallow areas, trout seek the cooler, deeper waters where they are less accessible to predation by eagles. It is likely that, at this time of the year, brown bullheads, other warm water fishes, and Canada goose goslings become more important in the diet of eagles at Lake Davis because they are more accessible to foraging birds.

Other lake renovation programs, such as at Diamond Lake in Oregon, have included a bald eagle supplemental feeding program for up to two breeding periods following treatment (USFWS 2004b). There are important differences between the Diamond Lake program and the renovation of Lake Davis. At Diamond Lake, algae blooms created major water quality and toxicity issues, such that restocking of the lake would not begin until mid-summer of the year following rotenone treatment or perhaps not even until the next year. Consequently, in order to maintain the nesting eagles at Diamond Lake, a supplemental eagle feeding program was required by USFWS (USFWS 2004b). At Lake Davis, however, an aggressive fish-stocking program is to begin soon after treatment, with an emphasis on stocking large fish suitable as eagle prey. Additional stocking following ice-off in spring after treatment would provide more fish to the system as the reservoir fills and fish grow rapidly.

The implementation of the proposed Lake Davis Pike Eradication Project would result in a temporary (at least 1 year) reduction in the fishery forage base available to bald eagles and osprey, which may result in a reduction in the reproductive success of these birds nesting at the reservoir. Based on eagle nesting and productivity history at Lake Davis, it would not be expected that two nesting territories would each produce two young in any given year. In addition, eagle productivity at Lake Davis in 2007 and 2008 is uncertain due to the mortality of an adult bird at the reservoir in 2005 and apparent establishment of a new territory (but not nesting) by an inexperienced pair in 2006. An aggressive trout stocking program, initiated immediately following treatment, would help to minimize the potential loss of eagle and osprey nestlings the first breeding season following treatment. However, pre-treatment fish availability would not be reached while the reservoir is refilling the first spring post-

treatment. It is expected that the productivity of Lake Davis in combination with the aggressive trout-stocking program, would allow fish densities to return to normal the second year following treatment even if the reservoir has not totally refilled.

There is an apparent reduction in eagle productivity under normal water levels and fish densities when there are two active nests at Lake Davis. The presence of two pairs of eagles at the reservoir prior to complete refill may result in additional pressures on the prey base and increased stress to the eagles inform less potential foraging area. Therefore, a supplemental feeding program would be implemented the year following rotenone treatment whereby food is made available to the eagles beginning at ice-out and extending until August 31 or as long as there is an active eagle nest at Lake Davis. Dead fish (rotenone-killed fish may be used) are to be provided to eagles at two sites within or adjacent to each active nesting territory. Several dead fish are to be placed early each morning on the ground near the shoreline or on an anchored raft floated on the water in view of a suitable eagle perch in the area where nesting or fledgling eagles have been active. Food would be provided every five out of seven days while skipping no more than one day in succession. The supplemental feeding program would continue the second (and subsequent) year(s) following treatment until reservoir levels are within 90 percent of the pre-drawdown surface area (2,554 surface acres; 37,936 acre-feet volume; 5,761 feet surface elevation) if there are two active eagle nests at the reservoir, or until 75 percent of pre-drawdown surface area (2,129 surface acres; 28,355 acre-feet volume; 5,757 feet elevation) is reached if one active eagle nest is present. Eagle nesting status and productivity at Lake Davis would be monitored by the DFG (or coordinated through the PNF) for a minimum of two breeding seasons following project implementation, including one year after the end of the supplemental feeding program, continuing until normal eagle productivity is documented.

These measures, designed to reestablish the Lake Davis fishery quickly for the benefit of bald eagles, would also benefit other fish-eating terrestrial wildlife including the osprey, white pelican, and common loon.

Under the Proposed Project, and in comparison to current conditions, all adverse effects to bald eagle, osprey, and other fish-eating species would be temporary. The greatest impact to these species would occur in the year of reservoir drawdown and the following spring. Some level of project-related impacts could last as long as five years depending on the rate of refill. When the effects of the Proposed Project are compared to the No Project environmental baseline (i.e., future conditions based on not implementing the Proposed Project), the Proposed Project would have temporary adverse impacts but would also have long-term beneficial impacts on these species. Without the elimination of the pike from Lake Davis, the fishery within the reservoir would eventually deteriorate along with its capability to support nesting eagles and osprey.

The Proposed Project has the potential to result in adverse effects to bald eagles, a species listed as threatened under the ESA. Adverse effects could be incurred by both nesting and transitory birds due to the temporary loss of the fish prey base at Lake Davis. In compliance with Section 7 of the ESA, interagency consultation would be initiated with the USFWS in order to address potential project-related adverse effects and incidental take of eagles. Any and all terms and conditions that would be established by USFWS in their biological opinion would be fully implemented as part of the Proposed Project.

Impact TW-4: The drawdown and/or treatment of Lake Davis with rotenone would result in a temporary loss of the primary food base for bald eagles and ospreys utilizing the reservoir and may contribute to nest failure for territories associated with Lake Davis. Initiating rotenone treatment prior to September 1 may constitute disturbance to nesting eagles due to the loss of the fishery prey base. The adverse impact is significant but mitigable.

Mitigation TW-4a: Due to potential project-related adverse effects to a species listed as threatened under the ESA, interagency consultation with USFWS on the bald eagle would be completed prior to implementation of the project. Any and all terms and conditions that would be established by USFWS in their biological opinion would be fully implemented as part of the Proposed Project.

Mitigation TW-4b: An aggressive fish-stocking program would be implemented at Lake Davis with an emphasis on large fish to quickly restore the eagle and osprey prey base at Lake Davis to pre-treatment fish densities and size-class distribution. Stocking would be initiated in the fall following treatment of the reservoir and continue until pre-treatment fish densities are maintained, as indicated by results of fisherman creel surveys.

Mitigation TW-4c: If rotenone treatment occurs prior to September 1 and fledgling eagles are present at Lake Davis, a supplemental feeding program would be established whereby food is made available to the eagles until the time at which they would normally disperse. Dead fish (rotenone-killed fish may be used) are to be provided to eagles at two sites within or adjacent to each active nesting territory beginning before all dead fish are removed from the reservoir during cleanup. Several dead fish are to be placed early each morning on the ground near the shoreline or on an anchored raft floated on the water in view of a suitable eagle perch in the area where nesting or fledgling eagles have been active. Food would be provided every five out of seven days while skipping no more than one day in succession. Supplemental feeding would continue until at least September 1 and when all fledgling eagles are capable of dispersing from the area.

Mitigation TW-4d: A bald eagle supplemental feeding program would be implemented the year following rotenone treatment whereby food is made available to the eagles beginning at ice-out and extending until August 31 or as long as there is an active eagle nest at Lake Davis. Dead fish (rotenone-killed fish may be used) are to be provided to eagles at two sites within or adjacent to each active nesting territory. Several dead fish are to be placed early each morning on the ground near the shoreline or on an anchored raft floated on the water in view of a suitable eagle perch in the area where nesting or fledgling eagles have been active. Food would be provided every five out of seven days while skipping no more than one day in succession. The supplemental feeding program would continue the second (and subsequent) year(s) following treatment until reservoir levels are within 90 percent of the pre-drawdown surface area (2,554 surface acres; 37,936 acre-feet volume; 5,761 feet surface elevation) if there are two active eagle nests at the reservoir, or until 75 percent of pre-draw-down surface area (2,129 surface acres; 28,355 acre-feet volume; 5,757 feet elevation) is reached if one active eagle nest is present.

Mitigation TW-4e: Monitoring of eagle nesting status and productivity at Lake Davis would be conducted by the DFG (or coordinated through the PNF) for a minimum of two breeding

seasons following project implementation and would include one year following cessation of the supplemental feeding program, continuing until normal eagle productivity is documented.

Significance after Mitigation: Less than significant.

Impacts to insectivorous terrestrial wildlife due to the temporary reduction of the aquatic invertebrate community through treatment of Lake Davis and its tributaries with rotenone and/or water drawdown.

The drawdown of Lake Davis and application of rotenone to the reservoir and its tributaries would result in impacts to the aquatic invertebrate community. As detailed in the Aquatic Resources section of this report (Section 7.1.2), rotenone treatment would result in an initial reduction of aquatic macroinvertebrates that may reduce abundance for at least 22 months. Some macroinvertebrates tend to be more tolerant of rotenone and overall abundance is expected to decrease by 20 to 75 percent, but would recover in two months to three years.

Many species of aquatic invertebrates present at Lake Davis and its tributaries are preyed upon by terrestrial wildlife that forages in and around the water. The adult stages of many aquatic insect species emerge from the water and are available as prey to wildlife. Drawdown of the reservoir eliminates habitat for aquatic insects but results in expansion of habitat for terrestrial insects. Many terrestrial wildlife species that feed on insects are opportunistic in their foraging and prey selection; others tend to specialize on certain insect groups.

The temporary loss of aquatic insects has the potential to impact aquatic reptiles and amphibians. Though previous surveys have not located mountain yellow-legged frog, foothill yellow-legged frog, or northwestern pond turtle in the vicinity of Lake Davis, there is a possibility that these species may be present in the project area. These species would primarily be associated with stream habitats rather than Lake Davis, an artificial reservoir. The aquatic invertebrate community in streams is expected to recover more readily than lake/reservoir systems. In addition, reptiles and amphibians also consume terrestrial insects, and have the ability to travel short distances overland to other areas that may not have been treated. Treatment would occur in late summer or fall when individuals would be expected to be most robust and best able to tolerate a temporary shift in food supplies. Therefore, given the potentially limited number of individuals that the Proposed Project may impact, effects to aquatic amphibians and reptiles are considered less than significant.

Lake Davis and the surrounding terrestrial environments are potential habitat for a variety of bats including three USFS sensitive species: the Townsend’s big-eared bat (also a State species of special concern) pallid bat (also a state species of special concern, and western red bat; and one State species of special concern: the spotted bat. These bats are insectivorous and somewhat opportunistic, capable of capturing their prey while in flight. They have a variety of foraging styles, reflecting somewhat different preferred prey. The Townsend’s big-eared bat tends to feed selectively on moths; the pallid bat will capture large insects and scorpions off the ground; the spotted bat appears to feed primarily on large moths and some beetles; and the western red bat accepts a varied diet of insects including moths beetles, flies, and leafhoppers. The presence of these species has not been confirmed at Lake Davis, and no communal bat roost of any species is known from the vicinity.

Although these bat species prey heavily on terrestrial insects, all will forage on aquatic insects to some extent. Drawdown and rotenone treatment of Lake Davis and associated tributaries would temporarily degrade bat foraging habitat through the reduction of drinking water and aquatic prey items at the reservoir and along portions of the streams. However, project-related impacts to the aquatic prey base for bats are expected to have minor or negligible consequence to their populations because: bats are opportunistic feeders and are not likely dependent on a single source or location for food, the special status bat species tend to prey heavily on terrestrial insects, there is suitable foraging habitat available adjacent to the project area, and young of the year would be foraging on their own prior to treatment. Rotenone application would not be initiated prior to August 15; by late summer and into fall bats are probably starting to move to lower elevations, though others may pass through the area during their migration. During spring and summer following rotenone treatment the aquatic prey base would begin to recover, but the availability of aquatic insects would still likely be lower than at pre-treatment. Thus, bats in the area would likely still have to rely on terrestrial prey and adjacent habitat to supplement the limited aquatic prey base. These impacts to the aquatic prey base are expected to have less than significant consequences to the populations of bats.

Most insectivorous bird species in the project area are expected to shift their diets easily to accommodate fewer available terrestrial forms of aquatic insects. By late summer and fall most birds would have completed nesting although some fledglings may still be dependent on parent birds, especially if the rotenone treatment occurs prior to September 1. The willow flycatcher nests in association with dense willow thickets, often near or above standing water. This bird feeds heavily on aerial forms of aquatic insects, especially midges, gnats, and mayflies; their nesting season may extend to the end of August. The willow flycatcher is a California endangered species and a USFS sensitive species. This bird has been detected along tributary streams of Lake Davis though nesting has not been documented. It is known to nest nearby and suitable habitat is found along most of Lake Davis' tributary streams that are proposed for rotenone treatment. If treatment should occur while birds are actively nesting or tending to fledglings, there may be some level of impact to individuals.

Impact TW-5: The temporary loss of aquatic insects and their terrestrial forms may impact terrestrial species of insectivorous wildlife, including amphibians, reptiles, bats, and birds. The willow flycatcher is highly dependant on the aquatic-derived invertebrate prey base and suitable habitat is present in the project area. Activities related to the dewatering of streams and/or rotenone treatment may be initiated prior to September 1 and may overlap with the end of the willow flycatcher's nesting period. The adverse impact is significant but mitigable.

Mitigation TW-5: If dewatering activities and/or rotenone treatment would occur prior to September 1 along tributary streams of Lake Davis where suitable willow flycatcher habitat is found, pre-treatment surveys would be completed to document the absence of nests or fledglings in the area. If nesting/fledgling birds are found, drawdown activities (e.g., piping, pumping, and/or removal of vegetation) and/or treatment of the tributary stream with rotenone where nesting/fledging flycatchers are located will be postponed until after August 31.

Significance after Mitigation: Less than significant.

Impacts to terrestrial wildlife due to disturbance associated with water drawdown activities and/or treatment with rotenone at Lake Davis and its tributaries.

Generally, the activities associated with reservoir drawdown and the application of rotenone to Lake Davis would have a similar level of disturbance to terrestrial wildlife as human recreational activities during a busy summer weekend. However, drawdown activities associated with the tributaries require the presence of many people in otherwise secluded areas. Also, the potential rotenone treatment may be applied as early as August 15, and this would be within established limited operating periods for several species that are known from the project area or for which suitable habitat is present. Staging areas, including the concentrated activities associated with preparation and application of rotenone, may disrupt certain special status species. Staging activities are expected to be located south of Mallard Cove on the east side of the reservoir, and on the west side south of Jenkins Cove near the Camp 5 boat launch. A bald eagle primary use area has been established in the PNF Lake Davis Bald Eagle Habitat Management Area Plan (Schultz and Nickerson 2004) and includes an area just south of Jenkins Cove. This is the area where an eagle nest is located close to Forest Road 24N10.

Eagle responses to disturbances vary considerably depending on the type of disturbance and the experience of the individual birds. Management buffers are established based on distances necessary to avoid a flight response to human activity. The 0.5-mile (800-meter) nest-site buffer for major disturbances, established for active bald eagle nests at Lake Davis was based on local forest stand characteristics (Schultz and Nickerson 2004). The fact that an eagle nest is fairly close to a well-traveled road suggests some level of tolerance by this pair of eagles to human activities. The PNF Lake Davis Bald Eagle Habitat Management Area Plan (Schultz and Nickerson 2004) requires that disturbances to nesting territories be restricted through August 31.

If staging areas located within the vicinity of Jenkins Cove (or within 0.5 mile of an occupied eagle primary use area) are used prior to September 1, surveys for bald eagles would be completed to determine presence and nesting/post-nesting status. If eagles are actively using the area, an 0.5-mile (800-meter) buffer would be established around the active nest site (which includes the presence of post-fledging birds). The 0.5-mile (800-meter) buffer would be delineated as necessary using flagging or other methods to assure that there are no major disturbances from project activities to eagles within the buffer.

A great-gray owl PAC has also been designated in the Jenkins Cove area, although owl nests have not been located. On the east side of the reservoir near Lightning Point, outside of any expected staging area, a northern goshawk PAC has been established where a limited operating period extending to September 15 is applicable.

The activities associated with water drawdown and application of rotenone to Lake Davis' tributary streams may disrupt nesting and fledging willow flycatchers if activities occur prior to September 1 and the end of the established limited operating period. Flycatchers have been detected along tributary streams though nesting has not been documented. Suitable habitat is present along most tributary streams identified for rotenone treatment.

Impact TW-6: Activities associated with water drawdown and rotenone treatment of Lake Davis and its tributaries may cause disturbance to: bald eagles and great gray owls if these activities are initiated prior to September 1 in the vicinity of active nest-sites (e.g., Jenkins Cove area); to the goshawk if activities begin prior to September 15 within occupied PACs (e.g., Lightning Point vicinity); and to willow flycatchers prior to September 1 along tributary streams where suitable habitat is located. The adverse impact is significant but mitigable.

Mitigation TW-6a: If staging areas, located within the vicinity of Jenkins Cove (or within 0.5 mile of an occupied bald eagle primary use area or great gray owl PAC), are used prior to September 1, surveys for bald eagles and/or great gray owls will be completed to determine presence and nesting/post-nesting status. If bald eagles or great gray owls are actively using the area, an 0.5-mile (800-meter) buffer shall be established around active bald eagle nest sites and a 0.25-mile buffer around active great gray owl nest sites (which includes the presence of post-fledging birds). These buffers will be delineated as necessary using flagging or other methods to assure that there are no major disturbances to eagles or owls associated with the project within the buffer.

Mitigation TW-6b: If staging areas located within one mile of Lightning Point are used prior to September 15, surveys of the established northern goshawk PAC will be completed to determine presence and nesting/post-nesting status, and if occupied, to preclude project-related activities from the designated PAC, as necessary.

Mitigation TW-6c: If dewatering activities and/or rotenone treatment would occur prior to September 1 along tributary streams of Lake Davis where suitable willow flycatcher habitat is found, pre-treatment surveys will be completed to document the absence of nests or fledglings in the area. If nesting/fledgling birds are found, drawdown activities requiring the presence of personnel along the tributary streams and/or treatment of the tributary streams with rotenone where nesting/fledging flycatchers are located will be postponed until after August 31.

Significance after Mitigation: Less than significant.

7.2.2.5 Alternative A – 15,000 Acre-Feet (Plus Treatment Including Powder)

The environmental concerns for this alternative are essentially the same as that of the Proposed Project with the exception described below. Impacts TW-1 through TW-6 and the associated mitigation measures for the Proposed Project would apply.

Wildlife would have negligible inhalation exposure to powdered rotenone because they would not be in close proximity to the concentrated powder precluding direct exposure.

7.2.2.6 Alternative B – 5,000 Acre-Feet (Plus Treatment)

The environmental concerns for this alternative are essentially the same as that of the Proposed Project with the exception described below. Impacts TW-1, and TW-4 through TW-6 and the associated mitigation measures for the Proposed Project would apply.

Impacts associated with the drawdown of Lake Davis and the resulting reduction of aquatic and wetland habitats as used by terrestrial wildlife.

The drawdown of Lake Davis to a volume of 5,000 acre-feet results in a surface area of approximately 545 acres, at a surface elevation of 5,738 feet. As the water level recedes, the pool would be constrained to the deeper areas of the reservoir closer to the dam. Even though fish densities would be increasing in the remaining pool, bald eagles and osprey may have more difficulty getting to them due to the smaller reservoir surface and possibly higher concentration of human activities at the reservoir. Based on a review of past in-flow and discharge rates (Appendix D), the target drawdown level would be reached by September 1 in 21 of the past 38 years of record. Although foraging by eagles and osprey would be facilitated by the concentration of fish in the receding, at some point a limited reservoir surface area could reduce foraging opportunities while adult birds are attending to dependant young.

Impacts to bald eagle and other species are similar to the Proposed Project though differing by degree. The impacts to California gull, Canada goose and other nesting waterfowl would increase somewhat over the Proposed Project, potentially to the level of limiting most nesting at Lake Davis during the year of treatment. Though the target pool for treatment differs by project alternative, the water discharge rate from the reservoir remains the same for each alternative. Therefore, substantial impacts to nesting California gulls and Canada geese occur during drawdown equivalent to the Proposed Project. However, with drawdown to the 5,000 acre-foot level, the impacts to these species may be more severe in both the year of drawdown and the years following treatment because of the lower water level and extended refill period. Because the reservoir is drawn down so far in this alternative, the island used by nesting California gulls would become so fully integrated with the shoreline that fencing off the island from mammalian predators would not be feasible. Due to the extent of the land connection to the island, the gulls may not perceive the island as a safe nesting location. Delaying the drawdown to levels below the 5,760 feet elevation (36,000 acre-feet) until after July 31, to maintains the separation between the shore and island to protect nesting California gulls, would likely preclude reaching the target pool size of 5,000 acre-feet, in that it would take almost three months to drain 30,000 acre-feet from the reservoir even with the use of pumps.

Impact TW-7: The drawdown of Lake Davis could result in altering habitats used by various terrestrial wildlife species, including a reduction in the surface area of the reservoir used as foraging habitat by the bald eagle and osprey, and increased predation and reduced habitat for nesting and migrating Canada geese and other waterfowl. The adverse impact is significant and mitigable.

Mitigation TW-7: A bald eagle supplemental feeding program will be implemented beginning the year of treatment when the reservoir is drawn down below a volume of 15,000 acre-feet (surface area of 1,331 acres; surface elevation of 5,749 feet) and would continue through August 31 or as long as there is an active eagle nest at Lake Davis. In the year following rotenone treatment, food will be made available to the eagles beginning at ice-out and extending at least until August 31. Dead fish (rotenone-killed fish may be used) will be provided to eagles at two sites within or adjacent to each active nesting territory. Several dead fish are to be placed early each morning on the ground near the shoreline or on an

anchored raft floated on the water in view of a suitable eagle perch in the area where nesting or fledgling eagles have been active. Food will be provided every five out of seven days while skipping no more than one day in succession. The supplemental feeding program will continue the second (and subsequent) year(s) following treatment until reservoir levels are within 90 percent of the pre-drawdown surface area (2,554 surface acres; 37,936 acre-feet volume; 5,761 feet surface elevation) if there are two active eagle nests at the reservoir, or until 75 percent of pre-draw-down surface area (2,129 surface acres; 28,355 acre-feet volume; 5,757 feet elevation) is reached if one active eagle nest is present.

Significance after Mitigation: Less than significant

Impact TW-8: The drawdown of Lake Davis to the proposed water volume could result in providing a land or shallow-water connection to the island in Lake Davis that is used as a colonial nesting site by California gulls. The loss of the separation between the island and shore prior to completion of the gulls nesting period could allow predators access to the island when nesting gulls and their chicks are highly vulnerable. Refill of the reservoir to a level that would provide a water barrier around the island may occur prior to the first year post-treatment, or it may take four or five years. The adverse impact is significant and unavoidable.

Significance after Mitigation: Significant and unavoidable.

7.2.2.7 Alternative C – 35,000 Acre-Feet (Plus Treatment)

The environmental concerns for this alternative are essentially the same as that of the Proposed Project with the exception described below. Impacts TW-1 through TW-6 and the associated mitigation measures for the Proposed Project would apply.

Impacts of this alternative are similar, but smaller than those of the Proposed Project. The surface area of Lake Davis following drawdown would be approximately 2,429 acres, a reduction of 409 surface acres from pre-drawdown levels. The increasing fish density with decreasing reservoir size would not have the same degree of short-term beneficial effect to bald eagles and osprey that prey upon fish; however, the likelihood that human activities at the reservoir would preclude access by these birds to the reservoir is also reduced. Drawdown to 35,000 acre-feet would allow access by predators to the island used by colonial nesting California gulls.

7.2.2.8 Alternative D – 48,000 Acre-Feet (Plus Treatment)

The environmental concerns for this alternative are essentially the same as that of the Proposed Project with the exception described below. Impacts TW-1, and TW-4 through TW-6 and the associated mitigation measures for the Proposed Project would apply.

Impacts associated with the drawdown of Lake Davis and the resulting reduction of aquatic and wetland habitats used by terrestrial wildlife.

As this alternative does not require the drawdown of Lake Davis from current conditions, there would not be any potential impacts to wildlife due to drawdown.

Level of Significance: No impact.

7.2.2.9 Alternative E – Dewater Reservoir and Tributaries (No Chemical Treatment)

The environmental concerns for this alternative are more extensive than that of the other project alternatives, as described below. Impacts TW-4 in part, through TW-6 and the associated mitigation measures for the Proposed Project, and impact TW-2 and TW-3 and the associated mitigation measure for Alternative B would apply.

Even though this alternative does not include the application of rotenone, it still results in the elimination of the fishery and aquatic-derived invertebrate prey base that is fed upon by terrestrial wildlife. The extended drawdown, dewatered, and refill period under this alternative results in a longer timeframe and magnitude of effects. The activities associated with dewatering (e.g., construction of cofferdams, piping, pumping, and removal of vegetation) require more people, are more intrusive into wildlife habitats, occur over a time period of up to 45 days, and may have substantive impact to riparian habitats.

Exposure of terrestrial wildlife to rotenone through direct contact, ingestion of treated water, or consumption of fish killed by rotenone.

As this alternative does not include the application of rotenone, there would not be any potential exposure of wildlife to rotenone treated water or prey items killed by rotenone.

Level of Significance: No impact.

Impacts associated with the drawdown of Lake Davis and the resulting reduction of aquatic and wetland habitats as used by terrestrial wildlife.

The dewatering of tributary streams would eliminate habitat where mountain yellow-legged frogs, foothill yellow-legged frogs, and northwestern pond turtle may occur. Though previous surveys did not locate individuals of these species they may be present in the project area and would likely suffer mortality due to the dewatering of these habitats and the associated activities. Activities required to accomplish dewatering of tributary streams would include construction of cofferdams, and installation of pumps and pipelines. Removal of riparian vegetation may be necessary to gain access to streams. Willow flycatcher and yellow warbler habitat is present along many of the tributary streams, and there have been recent detections of flycatchers along Freeman Creek. Habitat requirements for the willow flycatcher and yellow warbler include dense stands of riparian vegetation within or adjacent to surface water. Removal of vegetation from suitable habitat patches may alter the structure and density of vegetation and degrade habitat to where it may no longer be suitable. Regeneration of the vegetation may take up to several years depending on the original stature of the vegetation that was removed. In addition, dewatering activities associated with streams that extend into forested areas would have potential impact to foraging habitats of California wolverine, American marten, Pacific fisher, and Sierra Nevada red fox.

Impact TW-9: The total drawdown of, and activities associated with, dewatering of tributary streams to Lake Davis that are potentially occupied by mountain yellow-

legged frog, foothill yellow-legged frog, and northwestern pond turtle may result in mortality to individuals, and loss and/or degradation of habitats. These activities may also destroy and/or degrade suitable habitat for willow flycatcher and yellow warbler. The adverse impact is significant but mitigable.

Mitigation TW-9a: Due to the potential for mortality of the mountain yellow-legged frog, foothill yellow-legged frog, and northwestern pond turtle from dewatering and/or the physical degradation of habitats associated with water drawdown activities, additional surveys for these species will be conducted in all areas of suitable habitat in tributary streams to Lake Davis where activities such as cofferdam construction or removal of streamside vegetation is to take place. These surveys will be conducted in accordance with standard protocols (DFG 2004c and DFG 2006g) during the same year of treatment and prior to major activities associated with dewatering of streams. If any of these species are found in areas to be dewatered, a concerted effort will be made to capture as many individuals as possible beginning two weeks prior to construction of cofferdams and/or removal of streamside vegetation. These individuals will be transported and released in suitable habitat in the immediate project area that would not be subject to dewatering, or held for release where captured following dewatering. Prior to transplantation of any animals to an adjacent waterbody, amphibians at both the source and donor sites will be tested for chytrid fungus (*Batrachochytrium dendrobatidis*). If animals from Lake Davis test positive, they would not be transplanted. If the proposed recipient site tests positive, alternate recipient sites should be screened until a site is found where chytrid fungus is absent. Decisions on whether animals are to be held animals or where they are to transplanted would be done in coordination with USFS and DFG biologists.

Mitigation TW-9b: Suitable willow flycatcher habitat along tributary streams will be flagged in order to reduce physical damage to vegetation during dewatering of these streams. Personnel would be informed of the presence of the flagging and the importance of minimizing damage to these habitats.

Mitigation TW-9c: Impacted riparian habitat along tributary streams will be restored to the maximum extent possible.

Mitigation TW-9d: Suitable willow flycatcher habitat impacted by dewatering activities will be restored at a ratio of three acres for each acre impacted.

Significance after Mitigation: Less than significant.

Impacts to fish-eating terrestrial wildlife due to the temporary reduction of the fish community through treatment of Lake Davis and its tributaries with rotenone and/or water drawdown.

Many of the effects of this alternative are essentially the same as those for the Proposed Project due to the loss of the Lake Davis fishery even though rotenone is not used as the method to eradicate northern pike. This alternative would have additional impacts because of the duration of the dewatering effort, including the time needed for the reservoir and tributaries to dry out and the time required for refill of the reservoir to a level suitable for reestablishment of a fishery to support eagles and osprey at Lake Davis. As the reservoir is drawn down, fish remain available to bald eagles and osprey; however, as the pool continues

to shrink and human activities associated with the dewatering increase, access to the reservoir by wildlife would become more difficult. Once the reservoir and tributaries have dried, the reservoir is to begin refilling and then a trout-stocking program would be initiated. Mitigation measures TW-4a, TW-4b, and TW-4e included with the Proposed Project under this issue are applicable to this alternative.

Impacts to terrestrial wildlife due to disturbance associated with treatment and/or water drawdown activities at Lake Davis and its tributaries.

Disturbance related effects of this alternative are greater than that of each of the other project alternatives. There is potential for disturbance to willow flycatcher, bald eagle, great gray owl, and California spotted owl under this alternative. There would be a total drawdown of the reservoir, and tributary streams would be dewatered through the construction of cofferdams and the use of an extensive network of pumps and piping of flows. Physical removal of riparian vegetation may be necessary to gain access to streams. These activities may occur prior to September 1 and the completion of the nesting season and established limited operating periods for the bald eagle, great gray owl, willow flycatcher, and California spotted owl resulting in potential disturbance to nesting or recent post-fledging birds. In addition, dewatering activities associated with streams that extend into forested areas could disturb foraging California wolverine, American marten, Pacific fisher, and Sierra Nevada red fox; dewatering activities in wet meadows may disturb roosting short-eared owls, and foraging Sierra Nevada snowshoe hares.

Impact TW-10: Activities associated with dewatering of Lake Davis tributary streams may cause disturbance to bald eagles and great gray owls if these activities are initiated prior to September 1 in the vicinity of active nest sites. Disruption of willow flycatchers may occur prior to September 1 along tributary streams where suitable habitat is located. The adverse impact is significant but mitigable.

Mitigation TW-10a: If there are activities associated with dewatering of streams within established bald eagle primary use areas (e.g., most of west side of Lake Davis and the Bagley Pass area extending almost to one mile from the shoreline) and they occur prior to September 1, surveys for bald eagles will be completed to determine presence and nesting/post-nesting status, and to establish an 0.5-mile (800-meter) buffer around active nest-sites/fledgling areas, as necessary.

Mitigation TW-10b: If there are activities associated with dewatering of streams within an established great gray owl PAC (e.g., along Dan Blough Creek) and they occur prior to September 1, surveys for great gray owls will be completed to determine presence and nesting/post-nesting status, and to establish an 0.25-mile buffer around active nest-sites/fledgling areas, as necessary.

Mitigation TW-10c: If activities associated with dewatering of streams would occur prior to September 1 along tributary streams of Lake Davis where suitable willow flycatcher habitat is found (including portions of Big Grizzly Creek, Freeman Creek, Cow Creek, Dan Blough Creek, and other streams), pre-treatment surveys will be completed to document the absence of nests or fledglings in the area. If nesting/fledgling birds are found, drawdown activities

requiring the presence of personnel along the tributary streams where nesting/fledging flycatchers are located is to be postponed until after August 31.

Mitigation TW-10d: If activities associated with dewatering of streams would occur prior to September 1 along Dan Blough Creek below Smith Peak or along Cow Creek parallel to and in the vicinity of Threemile Rock, surveys of the established California spotted owl PACs will be completed to determine presence and nesting/post-nesting status, and if occupied, project-related activities are to be precluded from the designated PAC, or from within 0.25 mile of nest location, as necessary.

Significance after mitigation: Less than significant.

7.2.2.10 Cumulative Impacts

A cumulative impact is the impact on the environment that results from the incremental impact of the action when added to the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant impact, but when its impacts are considered in sum with the impacts of other past, present, and reasonably foreseeable future actions, the impacts may be significant.

Definition of Analysis Area

The assessment of cumulative impacts for terrestrial wildlife includes the Big Grizzly Creek/Lake Davis watershed, extending downstream to the Middle Fork Feather River. For wide-ranging species such as the bald eagle, the geographic area of consideration extends beyond the Lake Davis watershed to include other adjacent habitat areas such as other lakes and reservoirs in the region (e.g., Frenchman Lake).

Terrestrial wildlife and their habitats have been, and will continue to be, impacted by most types of activities that occur in the Lake Davis area. Natural resources in the project area have long been impacted by activities such as livestock grazing, dairy farming, logging and timber harvesting. Fire (both human and natural caused) and fire management (including prescribed fire and fire suppression activities) have altered natural succession of forest and meadow habitats. Approximately 43 fires burned seven acres from 1970 to 1996, but the fires were detected and suppressed quickly. The construction of Grizzly Valley Dam and the creation of Lake Davis in 1968 altered habitats and facilitated establishment of nonnative fish including trout and northern pike. Recreation in the area includes hunting, fishing, hiking, horseback riding, mountain biking, pleasure driving, All-terrain vehicle (ATV) use, snowmobiles, swimming, ice skating, cross country skiing, snow play, ice fishing, wildlife viewing, camping, picnicking, and firewood gathering. The USFS has developed three campgrounds, four boat launches, and 20 fishing access points at Lake Davis. A network of paved and unpaved roads crosses most of the Lake Davis area, including roads to home sites and urban developments just south of the reservoir. Various species of noxious weeds are found in the area.

List of Projects Considered in the Cumulative Impacts Analysis

Many of these past actions contributed to, and perpetuate, current conditions that impact wildlife and their habitats. The cumulative impacts of the Proposed Project in combination with past, present, and anticipated future projects may bring about additional impacts to terrestrial wildlife over that of each separate action. Previous, present, or future projects and actions that were specifically considered in this cumulative impact analysis for terrestrial wildlife include:

USFS Grazing Allotments

Grazing would continue on areas adjacent to Lake Davis on private and National Forest lands at their current levels. Active grazing allotments include various numbers of authorized cow and calf pairs. Grazing can impact terrestrial wildlife when livestock eat and trample vegetation which results in decreased structural habitat diversity and contributes to a loss of cover and forage for wildlife. Livestock continues to contribute to bank erosion and sedimentation within streams, reducing water quality and potentially impacting wildlife by degrading habitats of prey species.

USFS Timber Harvest Projects

There have been timber harvesting activities in the project area since the early 1900s. Timber harvest can impact wildlife habitats through modification of forest structure and removal of large trees and snags, and soil erosion from skidding operations and the construction and use of roads. Disturbances associated with logging may disrupt wildlife nesting and breeding activities, movement and dispersal patterns, and use of an area for foraging.

USFS Forest and Fuels Management Projects

In addition to timber harvest projects, the USFS conducts forest and fuels management activities in the analysis area. This includes tree removal to reduce fire hazard, thinning for forest health, salvage cutting, pole cutting, tree planting, and public fuel woodcutting. These treatments may benefit retention and enhancement of some components of wildlife habitat (e.g., large trees and snags) although they still result in general disturbance to wildlife while activities are underway.

USFS Watershed Restoration Projects

The USFS performed a variety of restoration projects in Freeman Creek and Cow Creek from 1980 to 2000. Restoration activities included livestock enclosures, bank stabilization, willow planting, road closures and reseeding of disturbed areas. The effects of these projects is assumed to have reduced soil erosion and discharge problems in these areas, thus potentially improving wildlife habitat for a variety of species.

USFS Westside Lake Davis Restoration Project

This watershed restoration project would restore 50 headcuts and gullies to improve channel stability and reduce sedimentation in 20 stream channels within the project area. It is

assumed that this would improve sediment problems in the Lake Davis tributaries during the timeframe of the Lake Davis Pike Eradication Project. This action potentially improves habitat for various wildlife species both directly and indirectly.

USFS Freeman Project

The Freeman project proposes to implement fuel treatments in an area of moderate to high fuel loading through hazardous fuel reduction around communities in an area located from Lake Davis to Grizzly Ridge. Fuel treatments designed to allow the reintroduction of fire into the ecosystem would include thinning from below, mechanical thinning, group selection harvest, and aspen treatments to reduce ground fuels, reduce the number of snags, and open up stands. The project may result in loss of wildlife habitat components such as large trees and snags; however, all of the treatment options are designed to encourage regeneration of pine.

Department of Water Resources Northern Pike Containment Project

The project proposes the construction in 2006 of a containment system at the toe of Grizzly Valley Dam that would prevent pike, of any life stage, from escaping Lake Davis and moving downstream into Big Grizzly Creek, and into the Feather and Sacramento River system.

Private Development - Grizzly Ranch Development Project

The Grizzly Ranch Development Project is a residential subdivision that includes 380 homes on 1,042 acres, including a golf course. The project is currently being implemented and is expected to result in direct loss of wildlife habitat and bring more people into the area over longer periods of time, potentially increasing disturbance to wildlife in the Lake Davis area.

Proposed Project/Proposed Action – 15,000 Acre-Feet (Plus Treatment)

The Proposed Project may result in impacts to various species of wildlife due to effects associated with exposure to rotenone, temporary alteration of habitat through drawdown of Lake Davis, temporary loss of fish from Lake Davis as prey for terrestrial wildlife, temporary reduction of the aquatic invertebrate community as prey for terrestrial wildlife, and disturbances. Other projects, though quite different from the pike eradication project, may contribute to direct mortality of certain wildlife species, alterations of wildlife habitat, and/or disturbances. Several projects, including the Freeman Project, Westside Stream Headcut Restoration, and Fuels Management Project, that may result in temporary disturbances to wildlife, are designed to provide long-term benefits to wildlife through habitat improvement. Disturbances resulting from the Proposed Project are largely restricted to the actual proposed treatment period in late summer/fall 2006. That treatment period and activities associated with treatment may last as long as 45 days and begin as early as August 15, prior to the completion of established limited operating periods for nesting species such as the bald eagle, great gray owl, and willow flycatcher. Activities associated with other projects, including the Freeman Project and DWR fish containment project, could occur within the same general timeframe. The continuing development of private land south of Lake Davis to the City of

Portola, such as Grizzly Estates, result in more people in the vicinity of the reservoir throughout the year and a potential increase in disturbance to eagles in the area. Coordination among these projects, or delay of the Proposed Project until after August 31, could reduce the possibility that the bald eagle in particular would not be continuously disturbed on its nesting territory through the cumulative impacts of these projects.

In addition to the Proposed Project, other projects that may reduce the availability of fish as prey for wildlife includes the DWR fish containment project which is designed to kill any fish that would might otherwise pass downstream with released water. This action limits the potential presence of fish in Big Grizzly Creek below Grizzly Valley Dam to the Middle Fork Feather River, a distance of approximately five miles. For at least the last several years there has been some form of a fish elimination system at the dam outflow. This DWR project would improve the efficiency of the fish containment system but would not alter the current abundance of fish in Big Grizzly Creek below the dam. The reduction of the fishery due to the Proposed Project would result in adverse impacts to several species and these impacts may continue for one or two years despite an aggressive post-treatment fish stocking program. Some species that would likely be impacted by the reduced availability of fish at Lake Davis, such as the bald eagle, osprey, and white pelican are capable of foraging at other area lakes and reservoirs where fish are present.

Past and current activities that have continuing impacts and have likely contributed to the apparent loss of the mountain yellow-legged frog and foothill yellow-legged frog from the area include livestock grazing, hydrological alterations (e.g., damming the creek to create the reservoir), and presence of non-native predatory fish (e.g., pike and trout). The Proposed Project is to eliminate the pike from Lake Davis. This fish preys heavily on amphibian adults, larva, and eggs, especially since the fish is often found in shallow waters. Most species of trout also prey on amphibians, though likely not to the same degree as pike. However, whether the frogs persist in the area or become reestablished would not depend on the pike eradication project

Cumulative imapcts potentially associated with the proposed Lake Davis project would primarily be short-term disturbance to wildlife; no long-term modification of terrestrial wildlife habitat is included in the Proposed Project. Due to the limited time scale associated with the Proposed Project, the cumulative nature of projects co-occurring with the Proposed Project do not rise to the level of compromising management standards, including species viability or a substantial degradation of wildlife habitat above that analyzed under the Proposed Project.

Alternative A – 15,000 Acre-Feet (Plus Treatment Including Powder)

Cumulative impacts of this alternative are largely the same as for the Proposed Project, as the inclusion of powdered rotenone as a treatment option would not alter the project's potential impacts to wildlife or the cumulative relationship to other projects.

Alternative B – 5,000 Acre-Feet (Plus Treatment)

By drawing the reservoir down to 5,000 acre-feet with a resulting reservoir surface area of 550 acres, the drawdown period would be extended and the area available for bald eagles to

forage for fish would be reduced over that of the Proposed Project. If other activities in the area, including the Freeman Project, fuels management, watershed restoration activities, and activities associated with the Grizzly Ranch Development Project, cause disturbances to eagles during the nesting season and the reservoir reaches a size that inhibits access by foraging eagles, the cumulative nature of these impacts may result in impacts to the eagle greater than that anticipated from each individual action. Coordination among these projects could reduce the possibility that bald eagles would be disturbed on its nesting territory at the same time as access to feeding areas is restricted.

Alternative C – 35,000 Acre-Feet (Plus Treatment)

Cumulative impacts of this alternative are largely the same as for the Proposed Project. Retaining additional water in the reservoir would not alter the project's potential cumulative impacts to wildlife, which are primarily due to loss of the Lake Davis fish prey-base and disturbances associated with treatment activities.

Alternative D – 48,000 Acre-Feet (Plus Treatment)

Cumulative impacts of this alternative are largely the same as for the Proposed Project. Retaining additional water in the reservoir would not alter the project's potential cumulative impacts to wildlife, which are primarily due to loss of the Lake Davis fish prey-base and disturbances associated with treatment activities.

Alternative E – Dewater Reservoir and Tributaries (No Chemical Treatment)

This alternative is based on an extended period of dewatering for Lake Davis and its tributaries, including pumping and piping of water that would require increased activities at the reservoir and streams, and possible impacts to stream-side habitats. The additional activities associated with this alternative would likely increase the level and duration of project-related disturbance to bald eagles, as well as to species associated with riparian habitats on tributary streams. Therefore, the effects of this alternative with other activities in the area, including the Freeman Project, and stream headcut project, and Grizzly Ranch Development Project may cumulatively result in higher levels of disturbance to the bald eagle and riparian species (e.g., willow flycatcher, as implemented prior to September 1) than would occur as a result of each individual project. Coordination among these projects could reduce the possibility that disturbances from various sources do not occur, or are minimized over the same time period, especially by delaying the implementation of activities related to this project alternative along tributary streams until after September 1.

7.2.2.11 Environmental Impacts Summary

The potential impacts to terrestrial wildlife species due to the implementation of the proposed Lake Davis Pike Eradication Project is provided in Table 7.2.4 by alternative and based on the level of significance of the potential impacts as defined by NEPA and CEQA. The effect or impact determination for each special status species of terrestrial wildlife that could potentially occur in the project area is provided for each alternative in Table 7.2.5. These determinations are based on the implementation of all mitigation measures assigned to each

project alternative. The authorities under which special status has been designated to each species—the ESA, USFS, or DFG—establish the criteria for the determination of effect. Detailed project effects analysis are provided for ESA species in the Biological Assessment (DFG 2006j), for USFS sensitive species in the Biological Evaluation (DFG 2006l), and for USFS management indicator species in the Management Indicator Species Report (DFG 2006j).

Table 7.2-4 Summary Comparison of Impacts of Alternatives, Terrestrial Wildlife Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Project	A	B	C	D	E
Wildlife Resources							
1. Exposure of terrestrial wildlife to rotenone through direct contact, ingestion of treated water, or consumption of fish killed by rotenone.	N	SM, A	SM, A	SM, A	SM, A	SM, A	N
2. Reduction of aquatic and wetland habitats used by terrestrial wildlife due to drawdown of Lake Davis.	N	SM, A	SM, A	SU, A	SM, A	N	SM, A
3. Impacts to fish-eating terrestrial wildlife due to temporary reduction of the fish community and treatment and/or dewatering of Lake Davis and tributaries.	SU, A	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
4. Impacts to insectivorous terrestrial wildlife due to temporary reduction of the aquatic invertebrate community through treatment and/or drawdown of Lake Davis.	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
5. Impacts to terrestrial wildlife due to disturbance associated with treatment and/or water drawdown activities at Lake Davis and its tributaries.	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A

Key:
A = Adverse Impact (NEPA)
B = Beneficial Impact (NEPA)
LS = Less than Significant Impact (CEQA)
N = No Impact (CEQA, NEPA)
SM = Significant but mitigable Impact (CEQA)
SU = Significant and Unavoidable Impact (CEQA)

Table 7.2-5 Special Status Terrestrial Wildlife Species Effect Determinations

Species	ESA Status	USFS Status	State Status	Determination
Endangered Species Act Listed Species				
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT			All Project Alternatives No effect
Carson wandering skipper (*Pseudocopaedoes eunus obscurus*)	FE			All Project Alternatives No effect
California red-legged frog (*Rana aurora draytonii*)	FT		CSC	All Project Alternatives No effect
Giant garter snake (*Thamnophis gigas*)	FT		CT	All Project Alternatives No effect
Bald eagle (*Haliaeetus leucocephalus*)	FT		CE, FP	All Project Alternatives May affect, likely to adversely affect
USFS Sensitive Species				
Mountain yellow-legged frog (*Rana muscosa*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Northern leopard frog (*Rana pipiens*)		FSS	CSC	All Project Alternatives No Impact
Foothill yellow-legged frog (*Rana boylii*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Northwestern pond turtle (*Clemmys marmorata marmorata*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Swainson's hawk (*Buteo Swainsoni*)		FSS	CT	All Project Alternatives No impact
Northern goshawk (*Accipiter gentilis*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability

Table 7.2-5 Special Status Terrestrial Wildlife Species Effect Determinations

Species	ESA Status	USFS Status	State Status	Determination
Great gray owl (*Strix nebulosa*)		FSS	CE	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
California spotted owl (*Strix occidentalis occidentalis*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Greater sandhill crane (*Grus canadensis tabida*)		FSS	CT, FP	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Willow flycatcher (*Empidonax traillii*)		FSS	CE	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Pallid bat (*Antrozous pallidus*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)		FSS	CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Western red bat (*Lasiurus blossevillii*)		FSS		All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Sierra Nevada red fox (*Vulpes vulpes necator*)		FSS	CT	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
California wolverine (*Gulo gulo luteus*)		FSS	CT, FP	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability

Table 7.2-5 Special Status Terrestrial Wildlife Species Effect Determinations

Species	ESA Status	USFS Status	State Status	Determination
American (=pine) marten (*Martes americana*)		FSS		Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Pacific fisher (*Martes pennanti pacifica*)		FSS	CSC	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
California State Listed Species				
Cascade frog (*Rana cascadae*)			CSC	All Project Alternatives No Impact
Common loon (*Avia immer*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
American white pelican (*Pelecanus erthroohynchos*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Ferruginous hawk (*Buteo regalis*)			CSC	All Project Alternatives No impact
Osprey (*Pandion haliaetus*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Golden eagle (*Aquila chrysaetos*)			CSC	All Project Alternatives No impact
Northern harrier (*Circus cyaneus*)			CSC	All Project Alternatives No Impact

Table 7.2-5 Special Status Terrestrial Wildlife Species Effect Determinations

Species	ESA Status	USFS Status	State Status	Determination
Sharp-shinned hawk (*Accipiter striatus*)			CSC	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Cooper's hawk (*Accipiter cooperii*)			CSC	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
American peregrine falcon (*Falco peregrinus anatum*)	FD		CE, FP	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Prairie falcon (*Falco mexicanus*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Short-eared owl (*Asio flammeus*)			CSC	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Greater sage grouse (*Centrocerius urophasianus*)			CSC	All Project Alternatives No Impact
White-faced ibis (*Plegadis chihi*)			CSC	All Project Alternatives No Impact
California gull (*Larus californicus*)			CSC	Alternatives Proposed Project, A, C, D May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability Alternatives B, E May impact individuals, but is not likely to result in a trend toward Federal listing; may contribute to a loss of viability

Table 7.2-5 Special Status Terrestrial Wildlife Species Effect Determinations

Species	ESA Status	USFS Status	State Status	Determination
Black tern (*Chlidonias niger*)			CSC	All Project Alternatives No Impact
Black swift (*Cypseloides niger*)			CSC	All Project Alternatives No Impact
California horned lark (*Eremophila alpestris actia*)			CSC	All Project Alternatives No Impact
Bank swallow (*Riparia riparia*)			CT	All Project Alternatives No Impact
Yellow warbler (*Dendroica petechia*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Tricolored blackbird (*Agelaius tricolor*)			CSC	All Project Alternatives No Impact
Spotted bat (*Euderma maculatum*)			CSC	All Project Alternatives May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Pygmy rabbit (*Brachylagus idahoensis*)			CSC	All Project Alternatives No Impact
Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*)			CSC	Alternatives Proposed Project, A, B, C, D No impact Alternative E May impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability
Western white-tailed jackrabbit (*Lepus townsendii townsendii*)			CSC	All Project Alternatives No Impact
American badger (*Taxidea taxus*)			CSC	All Project Alternatives No Impact

ESA Listings
FT = Federally Threatened
FE = Federally Endangered
FD = Federally Delisted

USFS Listings
FSS = Forest Service Sensitive

State Listings
CSC = California Species of Concern
CT = California Threatened
CE = California Endangered
FP = Fully Protected Species

7.2.2.12 Monitoring

Some of the mitigation measures described in Section 7.2 would include monitoring activities.

7.3 Botanical Resources

7.3.1 Environmental Setting/Affected Environment

This section discusses the botanical resources within the project area and potentially affected areas downstream of the project area. The focus within this section is on vegetation communities and special status plant species. Section 7.3.1.1 provides a discussion of the communities present, including species typical of those communities. Section 7.3.1.2 provides a description of the special status plant species potentially present in the project area and their habitat requirements. Section 7.3.1.3 describes noxious weed species within the project area.

7.3.1.1 Vegetation Communities

The plant life surrounding Lake Davis is characterized as an east side pine complex with scattered aspen stands. Meadows and seeps are also present in the project area. Vegetation is sagebrush and grassy meadow with scattered pine on the flat terrain near the reservoir shore, particularly on the west side. This open vegetation grades to a dense stand of Jeffrey pine, ponderosa pine, and fir on the steeper slopes and ridges. Wet meadows surrounded by dense stands of lodgepole pine extend along the major tributary streams on the west side of the reservoir. These communities are described in more detail in the following sections.

Aquatic vegetation in the reservoir includes waterweed (*Elodea* spp.), coontail (*Ceratophyllum demersum*), pondweed (*Potomageton* spp.), water buttercup (*Ranunculus aquatilus*), arum-leaved arrow-head (*Sagittaria cuneata*), and filamentous algae. Aquatic vegetation begins growing during the spring, in some years creating up to 6-foot thick mats of vegetation covering nearly 100 percent of the reservoir from mid-summer through fall (DFG 2001). Between the reservoir level and high-water mark, vegetation consists of sedges (*Carex* spp.) and forbs tolerant of inundation.

East Side Ponderosa Pine Forest

East side ponderosa pine forest (ponderosa pine series) forms an open, park-like forest of coniferous evergreens dominated by ponderosa pine (*Pinus ponderosa*) (Holland 1986). Associated tree species include Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), and western juniper (*Juniperus occidentalis*). The understory is typically sparse, consisting of scattered shrubs typical of Great Basin sagebrush scrubs, including big sagebrush (*Artemisia tridentata*), ceanothus (*Ceanothus* spp.), and mountain mahogany (*Cercocarpus* spp.). Growth occurs mostly from late spring to midsummer and is probably limited by summer and

fall drought. All plants are essentially dormant in winter. This community is found near Lake Davis in the project area (DFG 2005d).

Jeffrey Pine Forest

Jeffrey pine forest (Jeffrey pine series) is tall, open forest dominated by Jeffrey pine, usually with a sparse understory of species typical of montane chaparral (ceanothus and manzanita) or sagebrush scrubs (sagebrush) (Holland 1986). This pine may also form dense stands in suitable conditions. Jeffery pine may form a mixed forest when co-dominant with white fir. This mixed forest may include ponderosa pine, incense cedar (*Calocedrus decurrens*), lodgepole pine (*Pinus contorta* ssp. *murrayana*), sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), lodgepole pine, and Douglas fir (*Pseudotsuga menziesii*).

In the project vicinity, this forest is found mostly at lower to middle elevations on rocky or thin soils. Herbaceous species commonly associated with Jeffrey pine forest in the project vicinity include spurred lupine (*Lupinus arbustus*), woolly mule's-ears (*Wyethia mollis*), and wavy-leaved Indian paintbrush (*Castilleja applegatei*) (Moore and Jennings 2004).

Sierran White Fir Forest

Sierran white fir forest (white fir series) consists almost entirely of a dense stand of white fir, with little understory (Holland 1986), but scattered incense cedar may be present. This community is common at middle to high elevations within the project area, on slopes and deeper soils (Moore and Jennings 2004). This fir may form a mixed forest when co-dominant with Jeffrey pine.

Red Fir Forest

Red fir forest (red fir series) is similar to Sierran white fir forest, but is even denser, with little or no understory (Holland 1986). Although this forest usually consists of essentially pure stands of red fir (*Abies magnifica*), sugar pine and white fir are often present in red fir forests in the project vicinity (Moore and Jennings 2004). The growing season is primarily mid-summer. This community is present at some higher-elevation locations in the project vicinity.

Aspen Forest

Aspen forest (aspen series) is dominated by aspen (*Populus tremuloides*) (Holland 1986). Dense groves have a sparse understory. In more open stands, the understory includes a variety of small shrubs and herbaceous perennials typical of mesic habitats in the area. Although these stands are often associated with streams, this vegetation community may occur away from streams, near springs or other areas with high soil moisture. The growing season is from late spring or early summer through early fall. Aspen stands are considered a special habitat on the PNF.

Lodgepole Pine Forest

Lodgepole pine forest (lodgepole pine series) is typically a dense forest of slender trees, often in nearly pure stands of lodgepole pine, although other tree species may be scattered in the stand (Holland 1986). The understory is usually sparse, but low shrubs and perennial herbs occur in openings in the forest. The growing season is primarily in the early summer, as drought may be a limiting factor in late summer.

Big Sagebrush Scrub

Big sagebrush scrub (big sagebrush series) is dominated by big sagebrush (*Artemisia tridentata*) and other soft-woody shrubs (Holland 1986). Associated species include bitterbrush (*Purshia tridentata*) and rabbitbrushes (*Chrysothamnus* spp.). The ground is usually bare underneath and between the shrubs. The growing season is primarily late spring and early summer. In the project vicinity, this community is found in valleys near Lake Davis, bordering meadows, lodgepole or Jeffrey pine forests, on slopes and ridges, and in forest openings (Moore and Jennings 2004).

Subalpine Sagebrush Scrub

Subalpine sagebrush scrub (low sagebrush series) is similar to, and intergrades with, big sagebrush scrub (Holland 1986). However, subalpine sagebrush scrub is dominated by dwarf shrubs, particularly low sagebrush (*Artemisa arbuscula*) and black sagebrush (*Artemisia nova*). The growing season is limited to summer. In the project vicinity, this community is found at scattered locations near Lake Davis, in depressions with perched water tables, on vernally wet claypans, or bordering big sagebrush shrublands (Moore and Jennings 2004).

Montane Riparian Scrub

Montane riparian scrub (various willow series and mountain alder series) consists of open to dense, shrubby riparian thickets dominated by various willows (*Salix* spp.), mountain alder (*Alnus incana* ssp. *tenuifolia*), or dogwoods (*Cornus* spp.) (Holland 1986). In the project area, this vegetation is found along Cow, Freeman, and Big Grizzly creeks (Dittes 2000). Dominant species in the project vicinity include Lemmon's willow (*Salix lemmonii*), Geyer's willow (*Salix geyeriana*), and occasional trees of shining willow (*Salix lasiandra* var. *lucida*).

Riparian scrub is considered a sensitive vegetation community.

Dry Montane Meadow

Montane meadow consists of a dense growth of sedges (*Carex* spp.) and other perennial herbs (Holland 1986). In dry montane meadows, soils are saturated for only part of the growing season. Dominant species in dry montane meadows in the project vicinity include spike-rushes (*Eleocharis* spp.), rushes (*Juncus* spp.), Kentucky bluegrass (*Poa pratensis*), and a variety of forbs (Burmester 2001). Other herbaceous species commonly found in dry meadows in the project vicinity include one-sided bluegrass (*Poa secunda*), squirreltail

(*Elymus elymoides*), rushes (*Juncus* spp.), and hairy pyrrocoma (*Pyrrocoma hirta* var. *lanulosa*) (Dittes 2000).

In the project vicinity, dry meadows are found on the flatter areas near Lake Davis and valleys along the tributary streams (Moore and Jennings 2004). Dry meadows may also be found on higher slopes, in openings in the forests.

Wet Montane Meadow

Montane meadow consists of a dense growth of sedges (*Carex* spp.) and other perennial herbs (Holland 1986). Wet montane meadows have soils that are saturated throughout the year. Herbaceous species commonly found in wet meadows in the project vicinity include tufted hairgrass (*Deschampsia caespitosa*), spike bentgrass (*Agrostis exarta*), rushes (*Juncus* spp.), and five-finger cinquefoil (*Potentilla gracilis*) (Dittes 2000).

The growth period is primarily from late spring through summer. Wet meadows in the Lake Davis area are often surrounded by dense stands of lodgepole pines (DFG 2005d). In the project area, wet meadows are found near Lake Davis or are associated with springs and seeps. Wet montane meadow is considered a sensitive vegetation community.

Seeps

There are numerous groundwater seeps and springs within the project area (Moore and Jennings 2004). These habitats are considered sensitive resources because they provide valuable habitat for a diversity of plants and wildlife and perform essential ecological and hydrological functions. Seeps are categorized as a special habitat on the PNF.

Shoreline

The shoreline zone at Lake Davis fluctuates with the rise and fall of the reservoir pool. The composition of vegetation in the exposed zone below the high-water line varies according to the period of time that the soil has been exposed. Burmester (2001) reported that the lowest portions of the exposed shoreline are sparsely vegetated. Nearest to the water the most commonly observed species nearest to the water were Brewer's navarretia (*Navarretia breweri*) common knotweed (*Polygonum arenastrum*), curve-fruited yellow-cress (*Rorippa curvisiliqua*), panicled willow-herb (*Epilobium brachycarpum*), and cinquefoils (*Potentilla* spp.). Midway between the water and the maximum reservoir elevation, the vegetation consisted of downy popcornflower (*Plagiobothrys mollis* var. *mollis*), leafy prairie lupine (*Lupinus lepidus* var. *confertus*), in addition to Brewer's navarretia, panicled willow-herb, and cinquefoils. Burmester (2003) reported that the upper-most potion of the exposed land below the maximum reservoir level the vegetation was abundant and included leafy prairie lupine, meadow beardtongue (*Penstemon rydbergii* var. *oreocharis*), Baltic rush (*Juncus balticus*), green-leaved meadow arnica (*Arnica chamissonis* var. *foliosa*), and asters (*Aster* spp.).

7.3.1.2 Special Status Plant Species

Special status plant species include species listed by the USFWS as Threatened or Endangered under provisions of the Federal Endangered Species Act (ESA) of 1973 (16 USC 1531 et. seq.), as amended, as well as Proposed and Candidate species for listing (USFWS 2006b).

Special status species also include those designated by the USFS as sensitive and as needing special management attention because of known or suspected species and/or habitat viability problems. The USFS considers the long-term conservation needs of these species in order to avoid future population declines and the need for listing under the ESA. The USFS also considers potential impacts to "watch list" species, categorized as PNF special-interest species.

Special status species also include plant species listed as Rare, Threatened, or endangered by DFG under provisions of the California Endangered Species Act (CESA) and the 1977 Native Plant Protection Act (NPPA) (DFG 20063). Special status species also include plant species on List 1A (plants presumed extinct in California), List 1B (plants rare, threatened, or endangered in California and elsewhere), or List 2 (plants rare, threatened, or endangered in California, but more common elsewhere) of the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Vascular Plants of California (CNPS 2001). These species are subject to state regulatory authority under the California Environmental Quality Act (CEQA). Plant species included on lists 3 and 4 of the CNPS Inventory could be also considered special status species, are considered to be of lower sensitivity. They generally do not fall under specific state or Federal regulatory authority, and specific mitigation considerations are generally not required for these species.

The CalFed Bay-Delta Program is providing funding to the Lake Davis Pike Eradication Project. CalFed established a 30-year plan that included a multi-species conservation strategy that addressed the long-term conservation of 153 species of plants. None of the plant species addressed in the CalFed plan is expected to occur in the project area.

A list of special status plant species with potential to occur in the project area was developed based on a review of the sources described above, as well as records from the California Natural Diversity Database for the project quadrangles (DFG 2006f) and previous environmental documents and reports for the project area. These include: *Survey for Special-Status Vascular Plant Species Conducted at Lake Davis Northern Pike Management Sites on Cow Creek, Freeman Creek, and Big Grizzly Creek, Plumas County, California (*Dittes 2000); *Botanical Survey, Lake Davis Detonation Cord Project, Mosquito Slough, Plumas County, California* (Burmester 2001); *Freeman Group Select Botany Survey, Final Report* (Moore and Jennings 2004); *Draft Project Description and Initial Study: Lake Davis Pike Eradication Project* (DFG 2005d); and *Freeman Project Environmental Assessment* (USFS 2006b). This list is provided in Appendix H, Table H-1. The list includes a brief synopsis of each species' habitat requirements, and the potential for the species or its habitat to occur in the Lake Davis project area. A total of 46 species (including one group of related species) are presented in Table H-1. However, 27 species have been eliminated from further project-specific analysis due to a lack of suitable habitat in the project area or no known occurrence records from the general vicinity.

Management directives in the LRMP and SNFPA are provided for special status plant species as a group, rather than for individual species. The primary directive is to maintain the long-term viability of threatened, endangered, proposed and sensitive plant species and ensure that management activities do not contribute to population declines (USFS 2004a).

Nineteen special status plants (including one group of related species) are known that occur or could potentially occur in the project vicinity (Table 7.3-1): lens-pod milk-vetch (*Astragalus lentiformis*), Modoc Plateau milk-vetch (*Astragalus pulsiferae* var. *coronenis*), Pulsifer's milk-vetch (*Astragalus pulsiferae* var. *pulsiferae*), Suksdorf's milk-vetch (*Astragalus pulsiferae* var. *suksdorfii*), Sheldon's sedge (*Carex sheldonii*), Sierra Valley ivesia (*Ivesia aperta* var. *aperta*), Plumas ivesia (*Ivesia serioleuca*), Quincy lupine (*Lupinus dalesiae*), sticky pyrrocoma (*Pyrrocoma lucida*), marsh skullcap (*Scutellaria galericulata*), sweet marsh butterweed (*Senecio hydrophiloides*), Lemmon's clover (*Trifolium lemmonii*), flat-leaved bladderwort (*Utricularia intermedia*), scalloped moonwort (*Botrychium crenulatum*), Mingan moonwort (*Botrychium minganense*), moonworts (*Botrychium* spp.), Bolander's bruchia (*Bruchia bolanderi*), three-ranked hump-moss (*Meesia triquetra*), and broad-nerved hump-moss (*Meesia uliginosa*). These plants and their habitats are described briefly below.

Table 7.3-1. Special Status Plant Species Potentially Occurring in the Project Area

Species	Species
lens-pod milk-vetch	Modoc Plateau milk-vetch
Pulsifer's milk-vetch	Sheldon's sedge
Sierra Valley ivesia	Plumas ivesia
Quincy lupine	sticky pyrrocoma
Lemmon's clover	scalloped moonwort
Mingan moonwort	moonworts
Bolander's bruchia	broad-nerved hump-moss
three-ranked hump-moss	Suksdorf's milk-vetch
marsh skullcap	sweet marsh butterweed
flat-leaved bladderwort	

Forest Sensitive Species

Lens-Pod Milk-Vetch (Astragalus lentiformis)

Lens-pod milk-vetch is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from May to July (CNPS 2001). Lens-pod milk-vetch is endemic to Plumas County, where it is found in Great Basin scrub and lower montane coniferous forest on shallow, volcanic soils among sagebrush at elevations from 4757 to 6315 feet. This milk-vetch is also sometimes associated with Jeffrey pine (DFG 2006b).

Lens-pod milk-vetch is known to occur in the project area near the shoreline of Lake Davis (Burmester 2001).

Modoc Plateau Milk-Vetch (Astragalus pulsiferae var. pulsiferae)

Modoc Plateau milk-vetch is a PNF sensitive species and a CNPS list 4 species. This perennial herb flowers from May to July (CNPS 2001). Modoc Plateau milk-vetch is found in friable sandy silt among basalt cobble in pinyon and juniper woodland and Great Basin scrub at elevations from 4,412 to 6,200 feet (DFG 2006f). In California, this species occurs in Lassen, Modoc, and Plumas counties.

Potential habitat for Modoc Plateau milk-vetch is present in the project vicinity (DFG 2006f, USFS 2006b).

Pulsifer's Milk-Vetch (Astragalus pulsiferae var. pulsiferae)

Pulsifer's milk-vetch is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from May to August (CNPS 2001). Pulsifer's milk-vetch is found in volcanic or clay soil in Great Basin scrub, lower montane coniferous forest, and pinyon and juniper woodland at elevations from 4,396 to 6,168 feet (DFG 2006f). This species occurs only in Plumas and Lassen counties.

Pulsifer's milk-vetch is known to occur within five miles of Lake Davis and suitable habitat is present in the project area (DFG 2006f).

Sheldon's Sedge (Carex sheldonii)

Sheldon's sedge is a PNF special-interest species and a CNPS list 2 species. This perennial herb flowers from May to August (CNPS 2001). Sheldon's sedge is found in mesic sites, along creeks and in wet meadows in lower montane coniferous forest, riparian scrub, marshes, and swamps at elevations from 3,494 to 5,758 feet (DFG 2006f). In California, this species has been reported from Lassen, Modoc, Placer, and Plumas counties.

Sheldon's sedge is known to occur in the project area (DFG 2006f).

Sierra Valley Ivesia (Ivesia aperta var. aperta)

Sierra Valley ivesia is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from June to September (CNPS 2001). Sierra Valley ivesia is found in grassy areas within Great Basin scrub, pinyon and juniper woodland, lower montane coniferous forest, and meadows at elevations from 4,839 to 7,546 feet. This plant usually occurs on loamy soils derived from volcanic substrates (DFG 2006f). In California, this Sierra Valley ivesia has been reported from Lassen, Plumas, and Sierra counties.

Sierra Valley ivesia is known to occur within five miles of Lake Davis and suitable habitat is present in the project area (DFG 2006f).

Plumas Ivesia (Ivesia serioleuca)

Plumas ivesia is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from May to September (CNPS 2001). Plumas ivesia is found in vernally mesic areas in Great Basin scrub, lower montane coniferous forest, meadows, and vernal pools at elevations from 4,757 to 6,562 feet (DFG 2006f). This species usually occurs on volcanic

substrates. Plumas ivesia has been reported from Lassen, Nevada, Placer, Plumas, and Sierra counties.

Plumas ivesia is known to occur in the project area at several locations on the margins of dry meadows (Dittes 2000, Moore and Jennings 2004, DFG 2006f).

Quincy Lupine (Lupinus dalesiae)

Quincy lupine is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from May to August (CNPS 2001). Quincy lupine is found in dry open or shaded slopes, summits, and along trails in lower montane coniferous forest and upper montane coniferous forest at elevations from 2,280 to 8,202 feet (DFG 2006f). This species is often found on disturbed soil. Quincy lupine has been reported from Butte, Plumas, Sierra, and Yuba counties.

Quincy lupine is known to occur within five miles of Lake Davis and suitable habitat is present in the project area (DFG 2006b).

Sticky Pyrrocoma (Pyrrocoma lucida)

Sticky pyrrocoma is a PNF sensitive species and a CNPS list 1B species. This perennial herb flowers from July to October (CNPS 2001). Sticky pyrrocoma is found on alkaline flats in lower montane coniferous forest, meadows, and seeps at elevations from 2,296 to 6,168 feet (DFG 2006f). This species usually occurs on clay. Sticky pyrrocoma has been reported from Plumas, Sierra, and Yuba counties.

Sticky pyrrocoma is known to occur within five miles of Lake Davis and suitable habitat is present in the project area (DFG 2006f).

Lemmon's Clover (Trifolium lemmonii)

Lemmon's clover is a PNF special-interest species and a CNPS list 4 species. This perennial herb flowers from May to June (CNPS 2001). Lemmon's clover is found in sandy loam to clayey soils in the slopes and valleys vegetated by Great Basin scrub and lower montane coniferous forest at elevations from 4,921 to 5,905 feet (DFG 2006f). In California, this species has been reported from Nevada, Plumas, and Sierra counties.

Lemmon's clover is known to occur in the project area (Moore and Jennings 2004). This species was found growing in an open, low-sage dominated, hard-pan swale in the Freeman Creek watershed in the vicinity of a Plumas ivesia population.

Scalloped Moonwort (Botrychium crenulatum)

Scalloped moonwort a PNF sensitive species and a CNPS list 2 species. This perennial fern produces spores from June to July (CNPS 2001). Scalloped moonwort is found in wet meadows near creeks in vegetation communities of bogs, fens, meadows, and lower montane coniferous forest at elevations from 4,921 to 8,760 feet (DFG 2006f). In California, this species has been reported from Butte, Colusa, Los Angeles, Mono, Modoc (tentatively), San Bernardino, Tehama, and Tulare counties.

Populations tentatively identified as Mingan moonwort, but that may include scalloped moonwort, are known to occur in the project area (Moore and Jennings 2004).

Mingan Moonwort (Botrychium minganense)

Mingan moonwort a PNF sensitive species and a CNPS list 2 species. This perennial fern produces spores from July to August (CNPS 2001). Mingan moonwort is found along creekbanks in lower montane coniferous forest at elevations from 4,921 to 7,464 feet (DFG 2006f). In California, this species has been reported from Butte, Fresno, Nevada (tentatively), and Tehama counties.

Populations tentatively identified as Mingan moonwort are known to occur in the project area (Moore and Jennings 2004).

Moonworts (Botrychium ascendens, B. lineare, B. lunaria, B. montanum, and B. pinnatum)

Moonworts in the Project area could include any or all of the species *Botrychium ascendens*, *B. lineare*, *B. lunaria*, *B. montanum*, and *B. pinnatum*. All of these species are PNF sensitive species, and all but *Botrychium lineare* are CNPS list 2 species. *Botrychium lineare* is a federal candidate species and a CNPS list 1B species. These perennial ferns are found in mesic conditions, generally near creeks, in vegetation communities ranging from meadows, lower montane coniferous forest, and upper montane coniferous forest to subalpine coniferous forest (*B. lunaria* only) at elevations from 4,921 to 8,530 feet (DFG 2006f). In California, these species variously have been reported from counties.

Populations tentatively identified as Mingan moonwort, but that may include any or all of these five species, are known to occur in the project area (Moore and Jennings 2004).

Bolander's Bruchia (Bruchia bolanderi)

Bolander's bruchia is a PNF sensitive species and a CNPS list two species (CNPS 2001). This moss is found on damp soil in meadows, seeps, lower montane coniferous forest, and upper montane coniferous forest at elevations from 5,577 to 9,186 feet (DFG 2006f). Bolander's bruchia is an ephemeral species that utilizes disturbed sites. In California, this species has been reported from Fresno, Mariposa, Nevada, Plumas, Tehama, Tulare, and Tuolumne counties.

Suitable habitat for Bolander's bruchia is present in the project area (DFG 2006f).

Three-Ranked Hump-Moss (Meesia triquetra)

Three-ranked hump-moss is a PNF sensitive species and a CNPS list 2 species (CNPS 2001). This moss is found on mesic soil in bogs, fens, meadows, seeps, and upper montane coniferous forest at elevations from 4,265 to 8,204 feet (DFG 2006b). In California, three-ranked hump-moss has been reported from Butte, El Dorado, Fresno, Humboldt, Plumas, Siskiyou, and Tulare counties.

Suitable habitat for three-ranked hump-moss is present in the project area (DFG 2006f). This species occurs in the same habitats as broad-nerved hump-moss, which is known to occur in the project area.

Broad-Nerved Hump-Moss (Meesia uliginosa)

Broad-nerved hump-moss is a PNF sensitive species and a CNPS list 2 species (CNPS 2001). This moss is found on damp soil in meadows, seeps, and upper montane coniferous forest at elevations from 4,265 to 8,202 feet (DFG 2006f). In California, broad-nerved hump-moss has been reported from Fresno, Mariposa (tentatively), Siskiyou, and Tulare counties.

Broad-nerved hump-moss is known to occur in the project area (DFG 2005d).

Other Special Status Plant Species

Suksdorf's Milk-Vetch (Astragalus pulsiferae var. suksdorfii)

Suksdorf's milk-vetch is a CNPS list 1B species. This perennial herb flowers from April to August (CNPS 2001). Suksdorf's milk-vetch is found in volcanic or clay soil in Great Basin scrub, lower montane coniferous forest, and pinyon and juniper woodland at elevations from 4,265 to 6,332 feet (DFG 2006f). This plant often occurs on gravelly or rocky substrates. In California, Suksdorf's milk-vetch has been reported from Lassen, Modoc, Plumas, and Shasta counties.

Suksdorf's milk-vetch is known to occur within five miles of Lake Davis and suitable habitat is present in the project area (DFG 2006f).

Marsh Skullcap (Scutellaria galericulata)

Marsh skullcap is a CNPS list 2 species. This perennial herb flowers from July to October (CNPS 2001). Marsh skullcap is found in swamps and wet places in lower montane coniferous forest, marshes, swamps, meadows, and seeps at elevations from 0 to 6,890 feet (DFG 2006f). In California, this species has been reported from El Dorado, Lassen, Modoc, Nevada, Placer, Plumas, Shasta, San Joaquin, and Siskiyou (tentatively) counties. Marsh skullcap is widespread outside California.

Marsh skullcap is known to occur in Lake Davis USGS quadrangles and suitable habitat is present in the project area (DFG 2006f).

Sweet Marsh Butterweed (Senecio hydrophiloides)

Sweet marsh butterweed is a CNPS list 4 species. This perennial herb flowers from May to August (CNPS 2001). Sweet marsh butterweed is found on the edges of wet meadows and other wet sites in lower montane coniferous forest, meadows, and seeps at elevations from 1,608 to 9,186 feet (DFG 2006f). In California, this species has been reported from Lassen, Nevada, Placer, Plumas, and Sierra counties.

Sweet marsh butterweed is known to occur in the project area in the Cow Creek and Grizzly Creek watersheds (Dittes 2000).

Flat-Leaved Bladderwort (Utricularia intermedia)

Flat-leaved bladderwort is a CNPS list 2 species. This perennial herb flowers from July to August (CNPS 2001). Flat-leaved bladderwort is found along reservoir margins and other moist areas in bogs, fens, meadows, seeps, marshes, and swamps at elevations from 3,937 to 8,860 feet (DFG 2006f). In California, this species has been reported from Butte, Fresno, Modoc, Plumas, and Tulare counties. Flat-leaved bladderwort is widespread outside California in Idaho, Washington, Nevada, and Utah.

Flat-leaved bladderwort is known to occur in Lake Davis USGS quadrangles and suitable habitat is present in the project area (DFG 2006f).

7.3.1.3 Noxious Weeds

Management directives in the LRMP and SNFPA are provided for noxious weed species as a group, rather than for individual species. Management directives applicable to the project include: 1) emphasize Integrated Weed Management as a guiding process for weed control; 2) consider weed risk, prevention, and treatment in all NEPA documents; 3) minimize the introduction and establishment of noxious weed infestations as a result of heavy equipment; 4) prevent the introduction and establishment of weeds as a result of Forest Service-issued permits; and 5) contain and control established infestations (USFS 2004a).

Noxious weed species that have been reported from the project area include spotted knapweed, (*Centaurea maculosa*), Canada thistle (*Cirsium arvense*), broad-leaved pepperweed (*Lepidium latifolium*), field bindweed (*Convolvulus arvensis*), and bull thistle (*Cirsium vulgare*). An additional noxious weed species that has been reported from within five miles of Lake Davis is yellow star-thistle (*Centaurea solstitialis*). These species are briefly described below.

Spotted Knapweed (*Centaurea maculosa*)

Spotted knapweed is a CDFA category A noxious weed introduced from Europe. This species is reported to be widespread in California, occurring in disturbed areas up to 6,600 feet (Zouhar 2001a). There is one known spotted knapweed occurrence on the east shore of Lake Davis, at the Car Top Boat Launch north of Honker Cove. PNF has proposed to use herbicide to treat this site (PNF 2006b).

Canada Thistle (*Cirsium arvense*)

Canada thistle is a CDFA category B noxious weed introduced from Europe. This species is a widespread weed, but does not usually invade undisturbed forest. When vegetation or soil disturbance occurs, Canada thistle may colonize a wide variety of forest habitats (Zouhar 2001b). This species has been reported to occur on the shore of Lake Davis (USFS 2006b).

Broad-leaved (Perennial) Pepperweed (*Lepidium latifolium*)

Broad-leaved (perennial) pepperweed is a CDFA category B noxious weed introduced from Eurasia. This species is primarily invasive in riparian areas and wetlands (Zouher 2004).

Broad-leaved pepperweed has been reported to occur on the shore of Lake Davis (USFS 2006b).

Field Bindweed (*Convolvulus arvensis*)

Field bindweed is a California Department of Food and Agriculture (CDFA) category C noxious weed introduced from Europe, which grows on disturbed ground, fields, lawns, and roadsides. Two populations of this species were observed during surveys in the Freeman Creek watershed. One of these populations was eradicated by hand (Moore and Jennings 2004).

Bull Thistle (*Cirsium vulgare*)

Bull thistle is a noxious weed introduced from Europe, which grow in a wide range of environments. Habitats where this thistle may present a problem include pastures, overgrazed rangelands, recently burned forests and forest clearcuts, roads, ditches, and fences (Zouher 2002b). Populations of this species were observed during surveys in the Freeman Creek watershed (Moore and Jennings 2004). However, this species is not a scoped noxious weed species for the project area.

Yellow Star-Thistle (*Centaurea solstitialis*)

Yellow star-thistle is a CDFA category C noxious weed introduced from Europe. In California, this species is spreading into mountainous regions of the state (below 7,000 feet) from extensive populations in the Central Valley and adjacent foothills (Zouher 2002a).

7.3.1.4 Regulatory Environment

The regulatory environment for botanical resources are the same as the aquatic regulatory environment stated in 7.1.1.7 including those stated below which apply predominately to botanical resources.

Federal

Rivers and Harbors Act §10; 33 USC §201 et seq.

This act protects waters of the United States. The administering agency for the above authority is the U.S. Army Corps of Engineers (USACE).

Clean Water act of 1977; 33 USC §1251-1376; 30 CFR §330.5 (a))26)

These sections provide for the protection of wetlands. The administering agency for the above authority is the USACE.

Executive Order 11990, Protection of Wetlands (May 24, 1977)

This order provides for the protection of wetlands. The administering agency for the above authority is the USACE.

State

California Endangered Species Act of 1984, California Fish and Game Code §2050-2068, 2070-2089, and 2091-2097

This act includes provisions for the protection and management of species listed as endangered or threatened, or designated as candidates for such listing. Plants of California declared to be endangered, threatened, or rare are listed at 14 CCR §670.2. The administering agency for the above authority is the DFG.

Native Plant Protection Act of 1977; California Fish and Game Code §1900 et seq.

This act provides protection for state-designated rare and endangered plants and provides specific protection measures for identified populations. The administering agency for the above authority is the DFG.

7.3.2 Environment Impacts and Consequences

7.3.2.1 Environmental Concerns and Evaluation Criteria

Environmental concerns related to botanical resources and evaluation criteria are discussed in the following sections.

Environmental Concerns

Temporary Loss of Non-Sensitive Vegetation

Vegetation loss could result from construction of temporary access roads; grading of staging areas; off-road vehicle use; vegetation removal to facilitate hand-application of rotenone; the installation of up to 27 drip stations, from boats used for rotenone application, from vehicles carrying mounted sprayers; from coffer dam installation (approximately 300 coffer dams), pipe-laying and pump installation; from the temporary access disturbance at each coffer dam and pumping station location; or from accidental spills of chemicals and fuel. Vegetation loss for all alternatives is expected to be temporary, although it may be more extensive and entail a longer recovery period for Alternative E than for the Proposed Project and Alternatives A, B, C, and D. Even permanent habitat loss is not considered a significant impact on special status species (other than for listed or candidate species under the state and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected.

Temporary Loss of Riparian Vegetation

Implementation of the Proposed Project and alternatives would result in temporary impacts to riparian vegetation, particularly along tributary streams. For the Proposed Project and Alternatives A, B, C, and D, these impacts could result from vegetation removal to facilitate hand-application of rotenone; from the installation of up to 27 drip stations; from boats used for rotenone application; from vehicles carrying mounted sprayers; or from accidental spills of chemicals and fuel. For Alternative E, impacts to riparian vegetation along tributaries could result from vegetation removal to allow full inspection of the dewatered sections; from coffer dam installation (approximately 300 coffer dams), pipe-laying, and pump installation; from the temporary access disturbance at each coffer dam and pumping station location; or from accidental spills of chemicals and fuel. Aspen zones in the vicinity of Lake Davis could be affected by temporarily altering the hydrology near the drawdown zone.

Temporary Loss of Wetland Vegetation

Implementation of the Proposed Project and alternatives could result in temporary impacts to wetland vegetation (i.e., springs and seeps). For the Proposed Project and Alternatives A, B, C, and D, impacts could result from the removal of vegetation to facilitate rotenone application or from accidental spills of chemicals and fuel. For Alternative E, impacts would result from the removal of vegetation to facilitate dewatering by pumping and could result from accidental spills of chemicals and fuel.

Impacts to Special Status Plant Species

There are special status plant species that are known to occur in the project area. Other special status species may also occur outside the project area that could be affected by the Proposed Project or alternatives. Implementation of the Proposed Project or alternatives could cause direct mortality or indirect impacts from local alterations to habitat conditions.

Increased Spread of Noxious Weeds

Ground disturbance in the PNF during the implementation of the Proposed Project or alternatives could result in the spread of noxious weeds, to the detriment of native habitats.

Evaluation Criteria

The mandatory findings of significance as explained in CEQA, Pub. Res. Code sec. 21083; guidelines sec. 15065, indicate that a project will have a significant effect on biological resources if it will:

- Substantially degrade environmental quality;
- Substantially reduce fish or wildlife habitat;
- Cause a fish or wildlife habitat to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community; or
- Substantially reduce the numbers or range of a rare, threatened or endangered species.

Additional thresholds of significance for biological resources under CEQA have been used in the following evaluation. Impacts were considered significant if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or by the USFWS or by the USFS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the DFG or by the USFWS or by the USFS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

7.3.2.2 Evaluation Methods and Assumptions

A list of special status species that could occur in the project area was developed from existing biotic resource surveys of the project vicinity, as described in Section 7.3.1, the PNF list of sensitive species, and records from the California Natural Diversity Database (DFG 2006f). Existing biotic resource surveys and PNF documents were also used to develop a list of noxious weeds that could establish on disturbed sites in the project area.

Once the description of the environmental setting was developed using existing resource information, the resources described in that section were evaluated in light of the activities associated with the Proposed Project/Proposed Action and the alternatives to determine potential impacts and develop mitigation measures.

The effects for the Proposed Project and Alternatives A through E were estimated based on the following assumptions:

- Impacts to botanical resources could result from construction of access routes, foot traffic, installation and operation of pumps, pipelines, and cofferdams, as well as from removal of vegetation to facilitate inspection of treated tributaries, springs, and seeps and from the drawdown and refilling of the reservoir;
- Botanical resources will not be affected by rotenone; and
- The proposed project and its alternatives will comply with the PNF LRMP, as amended by the SNFPA.

7.3.2.3 No Project/No Action

There would be no changes in the current pike management program under this alternative. No impacts to terrestrial, riparian, or wetland vegetation or to special status plant species are expected to occur from the No Action alternative. No impacts from the spread of noxious weeds would occur with this alternative.

7.3.2.4 Proposed Project/Proposed Action – 15,000 Acre-Feet (Plus Treatment)

Temporary Loss of Non-Sensitive Vegetation

Vegetation loss could result from construction of temporary access roads; grading of staging areas; off-road vehicle use; vegetation removal to facilitate hand-application of rotenone; from the installation of up to 27 drip stations; from boats used for rotenone application; from vehicles carrying mounted sprayers; or from accidental spills of chemicals and fuel. Vegetation loss from the Proposed Project is expected to be temporary. Even permanent habitat loss is not considered a significant impact on special status species (other than for listed or candidate species under the state and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected.

Impact-VEG-1: Temporary loss of non-sensitive terrestrial vegetation is a less than significant adverse impact.

Mitigation VEG-1: To further reduce this impact, construction of additional access roads shall be minimized to the extent consistent with correct implementation of the Proposed Project.

Temporary Loss of Riparian Vegetation

Implementation of the Proposed Project and alternatives would result in temporary impacts to riparian vegetation, particularly along tributary streams. These impacts could result from vegetation removal to facilitate hand-application of rotenone; from the installation of up to 27 drip stations; from boats used for rotenone application; from vehicles carrying mounted sprayers; or from accidental spills of chemicals and fuel. Aspen zones in the vicinity of Lake Davis could be affected by temporarily altering the hydrology near the drawdown zone.

Impact VEG-2: The temporary loss of riparian vegetation is a significant but mitigable adverse impact.

Mitigation VEG-2a: Access routes, stream access points, and application sites shall be flagged and DFG staff shall be instructed to use only flagged access routes.

Mitigation VEG-2b: To the extent consistent with correct implementation of the project, access routes shall be located away from the riparian zone.

Mitigation VEG-2c: DFG staff shall be trained to minimize impact to this vegetation during rotenone application at these sites.

Mitigation VEG-2d: A spill prevention, containment, and clean-up plan shall be prepared and shall be implemented when the project begins in order to reduce the potential for impacts from accidental spills.

Mitigation VEG-2e: Within the PNF, all relevant management practices specified in the PNF LRMP and the SNFPA shall be implemented. Such management practices may require buffers from 200 to 600-feet-wide around streams, where direct access is not required to implement the project.

Significance After Mitigation: Less than significant.

Temporary Loss of Wetland Vegetation

Implementation of the Proposed Project could result in temporary impacts to wetland vegetation (i.e., springs and seeps) from the removal of vegetation to facilitate rotenone application or from accidental spills of chemicals and fuel.

Impact VEG-3: The temporary loss of wetland vegetation is a significant but mitigable adverse impact.

Mitigation VEG-3a: Wetland vegetation in the vicinity of project activities that can be avoided shall be flagged and temporarily fenced to prevent accidental impacts.

Mitigation VEG-3b: DFG staff shall be trained to minimize impact to this vegetation during rotenone application at these sites.

Mitigation VEG-3c: A spill prevention, containment, and clean-up plan shall be prepared and shall be implemented when the project begins in order to reduce the potential for impacts from accidental spills.

Mitigation VEG-3d: Within the PNF, all relevant management practices specified in the PNF LRMP and the SNFPA shall be implemented. Such management practices may require buffers of 100 feet or more around springs, seeps, and pools where direct access is not required to implement the project.

Significance After Mitigation: Less than significant.

Impacts to Special Status Plant Species

There are special status plant species that are known to occur in the project area. Other special status species may also occur outside the project area that could be affected by the Proposed Project. Implementation of the Proposed Project could cause direct mortality or indirect impacts from local alterations to habitat conditions.

Impact VEG-4: Direct adverse impacts to special status plant species are significant but mitigable.

Mitigation VEG-4a: Pre-project surveys shall be conducted at all potential disturbance areas to determine the presence of any special status plant species at the project sites.

Mitigation VEG-4b: All identified locations of special status plant species that can be avoided shall be flagged and species-appropriate buffer areas shall be fenced for avoidance prior to project implementation.

Mitigation VEG-4c: A worker environmental awareness training shall be conducted prior to project implementation. This training shall include information on identification and avoidance measures for special status species potentially present in the project area.

Mitigation VEG-4d: A spill prevention, containment, and clean-up plan shall be prepared before the project is implemented.

Mitigation VEG-4e: Within the PNF, all relevant management practices specified in the PNF LRMP and the SNFPA shall be implemented. Such management practices may include the requirement that all areas requiring seeding or planting shall use only locally collected native seed sources, if available.

Significance after Mitigation: Less than significant.

Increased Spread of Noxious Weeds

Ground disturbance in the PNF during the implementation of the Proposed Project could result in the spread of noxious weeds, to the detriment of native habitats.

Impact VEG-5: Noxious weed colonization of ground disturbed by Project-related actions is a significant but mitigable adverse impact.

Mitigation VEG-5a: A worker environmental awareness training shall be conducted prior to Project implementation. This training shall include information on identification and avoidance measures for noxious weed species of concern in the project vicinity.

Mitigation VEG-5b: In areas with known infestations within areas where soil disturbance is necessary, vegetation and topsoil shall be graded and stockpiled on the side of the site, adjacent to the area from which they were stripped, in order to isolate soil that may contain noxious weed seeds. This action would reduce the potential for construction equipment to transport seeds, roots, or rhizomes from site to site.

Mitigation VEG-5c: Reclamation of disturbed areas shall be implemented immediately following construction.

Mitigation VEG-5d: Fertilizer shall not be applied to reclaimed areas with known weed infestations, since nutrients can enhance the growth of weeds.

Mitigation VEG-5e: Straw bales used for sediment barriers or mulch shall be certified weed-free.

Mitigation VEG-5f. Within the PNF, all relevant management practices specified in the PNF LRMP and the SNFPA shall be implemented. These management practices may include cleaning all off-road equipment and vehicles used for project implementation at a vehicle washing station or steam cleaning facility before the equipment and vehicles enter the project area, and cleaning all off-road equipment prior to leaving areas infested with noxious weeds.

Significance After Mitigation: Less than significant.

7.3.2.5 Alternative A – 15,000 Acre-Feet (Plus Treatment Including Powder)

Impacts VEG-1, VEG-2, VEG-3, VEG-4, and VEG-5 and their associated mitigations would be the same as for the Proposed Project, because the drawdown and refill times and the rotenone application methods would be the same.

7.3.2.6 Alternative B – 5,000 Acre-Feet (Plus Treatment)

Impacts and mitigation for vegetation (Impacts VEG-1, VEG-2, VEG-3) under Alternative B would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would reduce the effects on the location and extent of the shoreline vegetation. This vegetation is subjected to fluctuating water levels under current operations.

Impacts and mitigation for special status plant species (Impact VEG-4) under Alternative B would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would reduce the effects on the location and extent of the shoreline vegetation. No special status species are expected to be affected in this zone.

Impacts and mitigation for noxious weeds (Impact VEG-5) under Alternative B would be less than those from the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would reduce area available for colonization by noxious weeds.

7.3.2.7 Alternative C – 35,000 Acre-Feet (Plus Treatment)

Impacts and mitigation for vegetation (Impacts VEG-1, VEG-2, and VEG-3) under Alternative C would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would affect only the location and extent of the shoreline vegetation. This vegetation is subjected to fluctuating water levels under current operations.

Impacts and mitigation for special status plant species (Impact VEG-4) under Alternative C would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would affect only the location and extent of the shoreline vegetation. No special status species are expected to be affected in this zone.

Impacts and mitigation for noxious weeds (Impact VEG-5) under Alternative C would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would increase only the area available for colonization by noxious weeds in the shoreline area. Any noxious weeds that establish in the additional exposed shoreline area would be eliminated when the reservoir refill is completed.

7.3.2.8 Alternative D – 48,000 Acre-Feet (Plus Treatment)

Impacts and mitigation for vegetation (Impacts VEG-1, VEG-2, and VEG-3) under Alternative D would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would affect only the location and extent of the shoreline vegetation. This vegetation is subjected to fluctuating water levels under current operations.

Impacts and mitigation for special status plant species (Impact VEG-4) under Alternative D would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would affect only the location and extent of the shoreline vegetation. No special status species are expected to be affected in this zone.

Impacts and mitigation for noxious weeds (Impact VEG-5) under Alternative D would be the same as for the Proposed Project, because the rotenone application methods would be the same and the difference in drawdown and refill times would increase only the area available for colonization by noxious weeds in the shoreline area. Any noxious weeds that establish in the additional exposed shoreline area would be eliminated when the reservoir refill is completed.

7.3.2.9 Alternative E – Dewater Reservoir and Tributaries (No Chemical Treatment)

Temporary Loss of Non-Sensitive Vegetation

Vegetation loss could result from construction of temporary access roads; grading of staging areas; off-road vehicle use; from vegetation removal to allow full inspection of the dewatered sections; from coffer dam installation (approximately 300 coffer dams), pipe-laying, and pump installation; from the temporary access disturbance at each coffer dam and pumping station location; or from accidental spills of chemicals and fuel. Vegetation loss for all alternatives is expected to be temporary, although it may be more extensive and entail a longer recovery period for Alternative E than for the Proposed Project and alternatives A, B, C, and D. Even permanent habitat loss is not considered a significant impact on special status species (other than for listed or candidate species under the state and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected.

Impact VEG-1 under Alternative E would be greater than the Proposed Project, because the additional access roads and pump installations would affect more vegetation. However, under this alternative, this impact would still be less than significant.

Mitigation measures: The same mitigation measures would apply to Alternative E (Mitigation VEG-1).

Significance After Mitigation: Less than significant.

Temporary Loss of Riparian Vegetation

Implementation of Alternative E would result in temporary impacts to riparian vegetation, particularly along tributary streams. These impacts could result from vegetation removal to allow full inspection of the dewatered sections; from coffer dam installation (approximately 300 coffer dams), pipe-laying, and pump installation; from the temporary access disturbance at each coffer dam and pumping station location; or from accidental spills of chemicals and fuel.

Impact VEG-2 under Alternative E would be greater than the Proposed Project, because the additional access roads, pump installations, coffer dams, and bypass pipes would affect more riparian vegetation. This alternative also requires the removal of all vegetation from the channels of perennial tributaries to Lake Davis.

Mitigation measures: The same mitigation measures would apply to Alternative E (VEG-2a, VEG-2b, VEG-2c, and VEG-2d).

Significance After Mitigation: Less than significant.

Temporary Loss of Wetland Vegetation

Implementation of Alternative E could result in temporary impacts to wetland vegetation (i.e., springs and seeps from the removal of vegetation to facilitate dewatering by pumping and/or accidental spills of chemicals and fuel. Impact VEG-3 under this alternative would be greater than under the Proposed Project, because all vegetation in seeps and springs would have to be removed. Under Alternative E, this impact would be less than significant after mitigation.

Mitigation measures: The same mitigation measures would apply to Alternative E (Mitigation VEG-3a, VEG-3b, VEG-3c, and VEG-3d).

Significance After Mitigation: Less than significant.

Impacts to Special Status Plant Species

There are special status plant species that are known to occur in the project area. Other special status species may also occur outside the project area that could be affected by Alternative E. Implementation of Alternative E could cause direct mortality or indirect impacts from local alterations to habitat conditions.

Impacts to special status plant species (Impact VEG-4) under this alternative would be the similar to or greater than for the Proposed Project, because of the additional access roads and pump installations. The removal of vegetation from the perennial streams and from seeps and springs could result in direct loss of individuals of special status plant species. However, under this alternative this impact would be less than significant after mitigation.

Mitigation measures: The same mitigation measures would apply to this alternative (Mitigation VEG-4a, VEG-4b, VEG-4c, VEG –4d, and VEG-4e).

Mitigation VEG-4f: If special status species of moss, including broad-nerved hump-moss, must be removed from springs and seeps during dewatering, these mosses will be stored in

appropriate conditions and returned to their original locations once the dewatering is completed.

Significance After Mitigation: Less than significant.

Increased Spread of Noxious Weeds

Ground disturbance in the PNF during the implementation of Alternative E could result in the spread of noxious weeds, to the detriment of native habitats.

Impacts from noxious weeds (Impact VEG-5) under this alternative could be greater than for the Proposed Project, because the installation of additional access roads, pumps, coffer dams, and bypass pipes and the removal of vegetation from the perennial streams and from seeps and springs could increase the area available for colonization by noxious weeds. Under Alternative E, this impact would be less than significant after mitigation.

Mitigation measures: The same mitigation measures would apply to this alternative (Mitigation VEG-5a, VEG-5b, VEG-5c, VEG-5d, VEG-5e, and VEG-5f).

Significance After Mitigation: Less than significant.

7.3.2.10 Cumulative Impacts

The following analysis evaluates the impacts of the Proposed Project when considered together with other closely related past, present, and reasonably foreseeable probable future projects. The analysis area is defined by Lake Davis, its tributary streams, and their watersheds. The analysis area includes riparian communities downstream from Lake Davis along the channel of Big Grizzly Creek, as far as its confluence with the Middle Fork Feather River. This analysis includes the potential impacts of the Freeman Project (USFS 2006b), the Grizzly Ranch Development Project, various fuel treatment projects, DFPZ maintenance projects, the Westside Lake Davis Watershed Restoration Project, and previous watershed restoration projects on Freeman and Cow creeks.

Cumulative Impacts Analysis for the Proposed Project

Vegetation

The Freeman Project and other fuel treatment projects and DFPZ maintenance projects are designed to improve forest health. Watershed restoration projects are also designed to improve habitat values. The extent of non-sensitive vegetation that will be permanently lost in the implementation of the Grizzly Ranch Development Project is not significant. The implementation of the Proposed Project in combination with these projects would not result in cumulatively considerable impacts.

The Freeman Project is expected to improve conditions for aspen stands, riparian vegetation, and forest health in general (PNF 2006). The Grizzly Ranch Development Project is designed to avoid impacts to riparian zones and to expand existing riparian areas as mitigation for any unavoidable impacts. Fuel treatment projects and DFPZ maintenance projects are designed to avoid or limit impacts to riparian habitats. Watershed restoration projects are designed to

restore the natural hydrological regime. Aspen habitat is expected to increase overall as a result of these restoration projects. Because these projects are expected to have either a beneficial effect or no effect on riparian zones, the implementation of the Lake Davis project in combination with these projects would not result in cumulatively considerable impacts to riparian vegetation.

The Grizzly Ranch Development Project is designed to avoid impacts to jurisdictional wetlands (springs). The Freeman project is expected to improve forest health in general (USFS 2006b). Fuel treatment projects and DFPZ maintenance projects are designed to avoid or limit impacts to meadow habitats. Watershed restoration projects are designed to restore the natural hydrological regime. Because these projects are not expected to impact seeps and springs the implementation of the Proposed Project in combination with these projects would not result in cumulatively considerable impacts to wetland vegetation associated with seeps and springs.

Special Status Plant Species

There would be no cumulative impacts to federally or state-listed plant species from the Proposed Project because no species in those categories occur in the project area.

No special status plant species were reported to occur at the Grizzly Ranch Development Project. The Biological Evaluation for the Freeman Project stipulates identification and avoidance of populations of special status plant species (USFS 2006b). Fuel treatment projects, DFPZ maintenance projects, and watershed restoration projects are designed to avoid or limit impacts to special status species. While complete avoidance of such populations may not be possible in the implementation of the Proposed Project; it, along with the above projects, will not result in cumulative considerable impacts.

The PNF is in the early stages of developing a proposal for eliminating noxious weeds at multiple sites across the forest by a variety of methods. One proposed method is treatment with chemical herbicides (PNF 2006b). The only site proposed for herbicide treatment on Lake Davis is a population of spotted knapweed at the Car Top Boat Launch north of Honker Cove. There are no known populations of special status species at this location. The eventual implementation of the Integrated Noxious Weed Eradication Program will not result in additional chemical impacts to special status plant species in the project area and will not result in cumulative considerable impacts.

Noxious Weeds

The Biological Evaluation for the Freeman Project stipulates detailed procedures for noxious weed management (USFS 2006b). Similar procedures are required for fuel treatment projects, DFPZ maintenance projects, and watershed restoration projects; and will be implemented for the Proposed Project. With the implementation of these mitigation measures, the impacts of the Proposed Project together with the other past, present, and reasonably foreseeable future projects will not be cumulatively considerable.

Cumulative Effects Analysis for Alternative A

Impacts to botanical resources from Alternative A are the same as for the Proposed Project. Therefore, the impacts of Alternative A, together with the other past, present, and reasonably foreseeable future projects, will not be cumulatively considerable.

Cumulative Effects Analysis for Alternative B

Impacts to botanical resources from Alternative B are the same as for the Proposed Project, except for the reduced exposure time for the shoreline. Therefore, the impacts of Alternative B, together with the other past, present, and reasonably foreseeable future projects, will not be cumulatively considerable.

Cumulative Effects Analysis for Alternative C

Impacts and mitigation for botanical resources under Alternative C would be the same as for the Proposed Project, except for the greater draw-down of the waterline and a potentially longer re-fill time. The impacts of Alternative C together with the other past, present, and reasonably foreseeable future projects will not be cumulatively considerable.

Cumulative Effects Analysis for Alternative D

Impacts and mitigation for botanical resources under Alternative D would be the same as for the Proposed Project, except for the greater draw-down of the waterline and a potentially longer re-fill time. The impacts of Alternative D together with the other past, present, and reasonably foreseeable future projects will not be cumulatively considerable.

Cumulative Effects Analysis for Alternative E

Vegetation

The Freeman Project and other fuel treatment projects and DFPZ maintenance projects are designed to result in improved forest health. Watershed restoration projects are also designed to result in improved habitat values. The extent of non-sensitive vegetation that will be permanently lost in the implementation of the Grizzly Ranch Development Project is not significant. The implementation of Alternative E in combination with these projects would not result in cumulatively considerable impacts.

The Freeman Project is expected to improve conditions for aspen stands, riparian vegetation, and forest health in general (USFS 2006b). The Grizzly Ranch Development Project is designed to avoid impacts to riparian zones and to expand existing riparian areas as mitigation for any unavoidable impacts. Fuel treatment projects and DFPZ maintenance projects are designed to avoid or limit impacts to riparian habitats. Watershed restoration projects are designed to restore the natural hydrological regime. Aspen habitat is expected to increase overall as a result of these restoration projects. Because these projects are expected to have either a beneficial effect or no effect on riparian zones, the implementation of Alternative E in combination with these projects would not result in cumulatively considerable impacts to riparian vegetation.

The Grizzly Ranch Development Project is designed to avoid impacts to jurisdictional wetlands (springs). The Freeman project is expected to improve forest health in general (USFS 2006b). Fuel treatment projects and DFPZ maintenance projects are designed to avoid or limit impacts to meadow habitats. Watershed restoration projects are designed to restore the natural hydrological regime. Because these projects are not expected to impact seeps and springs the implementation of Alternative E in combination with these projects would not result in cumulatively considerable impacts to wetland vegetation associated with seeps and springs.

Special Status Plant Species

There would be no cumulative impacts to federally or state-listed plant species from Alternative E because no species in those categories occur in the project area.

No special status species plant species were reported to occur at the Grizzly Ranch Development Project. The Biological Evaluation for the Freeman Project stipulates identification and avoidance of populations of special status plant species (USFS 2006b). Fuel treatment projects, DFPZ maintenance projects, and watershed restoration projects are designed to avoid or limit impacts to special status species. While complete avoidance of such populations may not be possible in the implementation of Alternative E; it, along with the above projects, will not result in cumulative considerable impacts.

The PNF is in the early stages of developing a proposal for eliminating noxious weeds at multiple sites across the forest by a variety of methods. One proposed method is treatment with chemical herbicides (PNF 2006b). The only proposed herbicide treatment site on Lake Davis is a population of spotted knapweed at the Car Top Boat Launch north of Honker Cove. There are no known populations of special status species at this location. The eventual implementation of the Integrated Noxious Weed Eradication Program will not result in additional chemical impacts to special status plant species in the project area and will not result in cumulative considerable impacts.

Noxious Weeds

The Biological Evaluation for the Freeman Project stipulates detailed procedures for noxious weed management (USFS 2006b). Similar procedures are required for fuel treatment projects, DFPZ maintenance projects, and watershed restoration projects; and will be implemented for Alternative E. With the implementation of these mitigation measures, the impacts of Alternative E together with the other past, present, and reasonably foreseeable future projects will not be cumulatively considerable.

7.3.2.11 Environmental Impacts Summary

Table 7.3-8 provides a summary comparison of impacts according to CEQA and NEPA requirements.

Table 7.3-8. Summary Comparison of Impacts of Alternatives, Botanical Resources

Affected Resource and Area of Potential Impact	Alternative						
	No Project Compared to Existing Conditions	Proposed Action	A	B	C	D	E
Botanical Resources							
1. VEG-1. Temporary loss of non-sensitive terrestrial vegetation	N	LS, A	LS, A	LS, A	LS, A	LS, A	LS, A
2. VEG-2. Temporary loss of riparian vegetation	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
3. VEG-3. Temporary loss of wetland vegetation	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
4. VEG-4. Direct impacts to special status plant species	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A
5. VEG-5. Noxious weed colonization of ground disturbed by project-related actions	N	SM, A	SM, A	SM, A	SM, A	SM, A	SM, A

Key:

A = Adverse Impact (NEPA)
B = Beneficial Impact (NEPA)
LS = Less than Significant Impact (CEQA)
N = No Impact (CEQA, NEPA)
SM = Significant but Mitigable Impact (CEQA)
SU = Significant and Unavoidable Impact (CEQA)

7.3.2.12 Monitoring

Monitoring will consist of pre-project surveys for the presence of special status plants in areas to be affected by project implementation.